Research Report

Practice Expenses Associated with Comprehensive Primary Care Capabilities

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Preface

Through programs such as the Comprehensive Primary Care (CPC) initiative and Comprehensive Primary Care Plus (CPC+), the Centers for Medicare & Medicaid Services (CMS) undertook projects by which they encouraged primary care practices to invest in "comprehensive primary care" capabilities. To assist CMS in designing alternative payment models (APMs) that adequately reimburse primary care practices for investing in these capabilities, this project developed and piloted a new method to estimate the expenses that practices incur to provide such capabilities.

A major goal of the project was to develop a method that could address a persistent question in estimating the costs of these capabilities: When various practices report widely divergent costs for a given comprehensive primary care capability (e.g., medication management), to what extent does the cost difference stem from different prices for the same capability, as compared to stemming from the practices having substantially different capabilities? Without detailed descriptions of the capabilities of each practice, this question cannot be answered empirically.

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Summary

Through programs such as the Comprehensive Primary Care (CPC) initiative and Comprehensive Primary Care Plus (CPC+), the Centers for Medicare & Medicaid Services (CMS) undertook a project by which they encouraged primary care practices to invest in "comprehensive primary care" capabilities. To assist CMS in designing alternative payment models (APMs) that adequately reimburse primary care practices for investing in these capabilities, this project developed and piloted a new method to estimate the expenses that practices incur to provide such capabilities.

A major goal of the project was to develop a method that could address a persistent question in estimating the costs of these capabilities: When various practices report widely divergent costs for a given comprehensive primary care capability (e.g., medication management), to what extent does the cost difference stem from different prices for the same capability, as compared to stemming from the practices having substantially different capabilities? Without detailed descriptions of the capabilities of each practice, this question cannot be answered empirically.

New Practice Expense Estimation Method for Comprehensive Primary Care Capabilities

We developed a mixed-methods strategy to collect cost and capability data in sufficient detail to inform CMS about payment for comprehensive primary care capabilities. Our strategy consisted of an initial interview with practice leaders to identify their comprehensive primary care capabilities and the types of costs associated with each capability, followed by researcher-assisted completion of a workbook tailored to each practice, which gathered data on the labor and nonlabor costs devoted to each comprehensive primary care capability. These were marginal cost estimates, net of any fee-for-service (FFS) revenues received. In a final brief interview, practice leaders reviewed summaries of the cost estimates and made corrections, if needed, before approving them.

To assess the validity of the labor estimates provided by practice leaders, we conducted interviews with frontline personnel and compared their capability-specific estimates of their own labor with those given by practice leaders. These interviews captured explanations for incongruous labor estimates.

Performance of the New Cost-Estimation Method

The cost-estimation method we developed required substantial time commitments from practice leaders and study staff. Even though participating practice leaders understood the

importance of the study and were supportive of it, many also reported being overwhelmed by competing priorities, which prolonged data collection. The median interval between initial interview completion and final practice approval of the cost summary was 96 days (with a range of 40 to 232 days).

Data collection from practices affiliated with parent organizations (e.g., hospital systems, independent practice associations [IPAs]) was especially challenging. Gathering data from organization-affiliated practices involved more parties (e.g., both practice and organization-level leaders) and posed greater scheduling challenges than from independent practices. This prolonged data collection for practices affiliated with parent organizations (median 105 days) compared to independent practices (median 75 days).

Practices also had difficulty estimating the startup costs of comprehensive primary care capabilities. For capabilities that were adopted more than a year or two before data collection, practice leaders were frequently uncertain regarding one-time initial labor-hour expenditures (e.g., hours spent on staff training).

Practice leaders used widely divergent methods of estimating panel sizes (e.g., number of patients listed in the practice's EHR as being empaneled to a practice PCP; number of patients seen in a given year, regardless of whether they were truly considered to be on the practice's panel), and many reported high levels of uncertainty regarding their panel-size estimates.

Despite these challenges, participating practice leaders reported that the final capability descriptions were accurate and that their cost summaries had face validity. Several remarked that participation was an eye-opening exercise, generating insight into financial sustainability for their practices.

Costs of Comprehensive Primary Care Capabilities

Fifty practices, sampled for diversity across CPC+ participation status, geographic region, rural status, size, and parent-organization affiliation, completed the data-collection process. Practices varied considerably in the comprehensive primary care capabilities they adopted. The most-commonly adopted capabilities were empanelment (92 percent of practices), same-day or next-day office visits (90 percent), patient education and self-management support (88 percent), and software-based communication infrastructure (86 percent).

The costs of comprehensive primary care capabilities ranged widely. Medication management had the highest annual median cost per full-time-equivalent primary care practitioner (FTE PCP) ($11,496 per year), and extended hours had the lowest ($0), because the majority of practices offering extended hours did so without incurring marginal costs (i.e., they paid no overtime and had no unfilled appointment slots).

In general, cost variation among practices ostensibly providing the same comprehensive primary care capability (e.g., among the multiple practice-reported services categorized as "medication management") was at least partially attributable to substantial differences in the level of service provided. However, price variation still played a role, such as when high-cost outlier practices appeared to offer the same service as lower-cost practices (e.g., because they

used more expensive labor mixes). With a sample of 50 practices, we were unable to estimate quantitatively the relative contributions of level-of-service variation and price variation to the variation in overall costs.

For nearly all capabilities, labor expenses exceeded nonlabor costs, and ongoing annual costs exceeded one-time startup costs. However, practice leaders expressed doubts about the accuracy of startup-cost estimates, especially for costs that had been incurred years earlier.

Frontline personnel generally confirmed practice-leader reports (72 percent average agreement across capabilities) regarding their participation in each capability and the amount of time they devoted to it. However, in some instances, frontline participants disconfirmed practice-leader reports by indicating that they either (1) did participate in a capability when they were not reported to do so (13 percent on average), (2) did not participate in a capability when they were reported to participate (5 percent on average), or (3) did participate but to a different degree (most often with a discrepancy of less than 0.5 days per week) than was reported by practice leaders (11 percent on average).

In addition, capability descriptions provided by practice leaders were generally consistent with those given by frontline staff. Our goal was not to determine whether levels of agreement between practice leaders and frontline participants were adequate (which might depend on the intended use of such data); rather, our focus was on highlighting discrepancies—both to document them and to provide specific examples from frontline participants that explained why discrepancies occurred.

Considerations for Future Data Collection and Payment Policy

Even within a small sample of 50 practices, the heterogeneity we observed in the costs and content of comprehensive primary care capabilities highlights the importance of gathering detailed capability descriptions. Without a basis in such descriptions, linked to capability costs, APMs would risk underpaying for some capabilities (e.g., if payment amounts are insufficient to reimburse practices for a desired high level of service) and overpaying for others (e.g., when practices provide the same level of service, but payment amounts are skewed by high-cost outliers).

A similar mixed-methods approach to estimating the costs of comprehensive primary care capabilities, deployed on a larger scale than in the current study, could serve as a robust basis for future payment models that seek to incentivize and sustain comprehensive primary care. However, gathering these data is labor-intensive for both data collectors and practice leaders, with few opportunities for economies of scale.

To address the challenges of collecting such detailed data, future efforts could plan for longer data-collection periods, experiment with offering greater financial incentives for participation, try to provide other types of incentives, or explore the possibility of compulsory participation (giving financial compensation to the sampled practices). Additional methodological development might be necessary to better estimate the startup costs of comprehensive primary care capabilities, capture the costs borne by parent organizations, estimate patient-panel sizes

consistently, and determine how much cost variation is attributable to differences in patient needs. Complementary methods, such as time and motion analysis, could help address the 28 percent disagreement rate between practice leaders and frontline staff regarding labor-cost estimates, thus improving the validity of those estimates.

Improving the accuracy and detail of the estimated expenses of comprehensive primary care capabilities would help CMS achieve its strategic goals for comprehensive primary care and serve as a resource for both practices and payers throughout the United States.

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Our acknowledgment of their contributions does not imply that these individuals endorse the contents of this report.

Abbreviations

AHRQ	Agency for Healthcare Research and Quality
APMs	alternative payment models
BLS	Bureau of Labor Statistics
CMS	Centers for Medicare & Medicaid Services
CPC	Comprehensive Primary Care
CPC+	Comprehensive Primary Care Plus
COR	contracting officer's representative
CPT	current procedural terminology
EHR	electronic health record
E&M	evaluation and management
ED	emergency department
FFS	fee-for-service
FQHC	Federally Qualified Health Center
FTE	full-time equivalent
HIT	health information technology
IPA	independent practice association
IQR	interquartile range
LMFT	licensed marriage and family therapist
MA	medical assistant
MPFS	Medicare Physician Fee Schedule
MSA	metropolitan statistical area
NCQA	National Committee for Quality Assurance
NP	nurse practitioner
PA	physician assistant
PCA	principal components analysis
PCMH	Patient-Centered Medical Home

PCMH-A	Patient-Centered Medical Home-Assessment
PCP	primary care practitioner
PFAC	patient and family advisory council
QI	quality improvement
RHC	Rural Health Center
RUCA	Rural Urban Commuting Area
TEP	technical expert panel

1. Background

This chapter summarizes the purpose of the study and provides an overview of key conceptual and practical issues in measuring the costs that practices incur to provide comprehensive primary care services.

Purpose

Through programs such as the Comprehensive Primary Care (CPC) initiative and Comprehensive Primary Care Plus (CPC+), the Centers for Medicare & Medicaid Services (CMS) has undertaken projects to encourage primary care practices to invest in "comprehensive primary care" capabilities. Empirical evidence suggests that these capabilities are important to improving the quality, outcomes, and efficiency of patient care (Starfield et al., 2005; Friedberg et al., 2010). However, comprehensive primary care capabilities involve activities that are frequently under-reimbursed (relative to their costs to primary care practices) or not reimbursed at all by the Medicare Physician Fee Schedule (MPFS). Therefore, primary care practices are likely to incur net financial losses on their comprehensive primary care capabilities, unless the costs of these capabilities are reimbursed under APMs.

To assist CMS in designing APMs that adequately reimburse primary care practices for investing in comprehensive primary care capabilities, this study developed and implemented a method to (1) describe the capabilities as currently implemented by a sampling of primary care practices and (2) estimate the financial costs of these capabilities from the perspective of the practices themselves. These capability descriptions and associated cost estimates are intended to illustrate the diversity of capabilities in current use and the variability of their costs.

Importantly, the methods of study developed in this project sought to address a persistent question in estimating the costs of these capabilities: When various practices report widely divergent costs for a given comprehensive primary care capability (e.g., medication management), to what extent does the cost difference stem from different prices for the same capability, as compared to stemming from the practices having substantially different capabilities? Without detailed descriptions of the capabilities within each practice, this question cannot be answered empirically.

Policy Context

The United States health care system is marked by high costs and uneven quality, which are often driven by care fragmentation, poor coordination across providers, and incentive systems that promote the use of low-value services. Strengthening the primary care system is a central

component of the policy approaches aimed at addressing these problems. In particular, emerging innovations in primary care delivery models have focused on helping primary care practices adopt structural capabilities and functions consistent with providing comprehensive primary care. To meet these aspirations, primary care practices must deliver patient services that extend beyond face-to-face evaluation and management (E&M) visits. For example, comprehensive primary care practices are called upon to adopt advanced primary care capabilities and functions, such as nurse care managers, expanded hours on weekends and evenings, and advanced health information technology (Berry et al., 2013; Gabbay et al., 2013; McNellis et al., 2013).

Under the MPFS and other fee-for-service (FFS) payment models, by which practices are paid for face-to-face patient care, practices traditionally provide advanced primary care capabilities and functions without any direct, explicit reimbursement from payers. Such under-reimbursed capabilities and functions, however, may be financially unsustainable for the practices that implement them. In an effort to promote comprehensive primary care, CMS has been experimenting with APMs. For example, CMS has recently begun paying practices for non-face-to-face consultations for chronic care management under a new current procedural terminology (CPT) code (Centers for Medicare & Medicaid Services, 2015). Other public and private payers have also begun disbursing such funds as part of medical home demonstration projects and in other settings, with payment amounts ranging from $0.60 per member per month to $444 per member per month (Robert Graham Center, 2013). CMS has also introduced CPC+, which is experimenting with different payment options to help support primary care practices (Centers for Medicare & Medicaid Services, 2016).

Defining "Comprehensive Primary Care"

For the purposes of this project, we define "comprehensive primary care" as a property of a given *capability* of a primary care practice. A capability either belongs to the set of comprehensive primary care capabilities or it does not. A practice can have any number (and any combination) of capabilities that are deemed comprehensive primary care. No matter how many such capabilities a practice might have, however, in this project we do not treat "comprehensive primary care" as a descriptor of a practice as a whole.

Multiple definitions of comprehensive primary care capabilities exist. To identify the set of practice capabilities deemed as "comprehensive primary care" in this study, we compare three definitions of CPC models developed by CMS:

1. The Modified Patient-Centered Medical Home-Assessment (PCMH-A) used in the evaluation of the CPC initiative (Peikes et al., 2016)
2. CMS's CPC+ Care Delivery Requirements (Centers for Medicare & Medicaid Services, 2016)
3. CMS's illustrative list of comprehensive primary care services, from the Statement of Work for this project

As shown in Table 1, these definitions collectively draw from 12 underlying constructs: comprehensiveness, care coordination, care management, risk stratification, population health, planned care, continuity, access to care, direct medical care, patient and caregiver engagement, data analytics, and quality improvement (QI) (Centers for Medicare & Medicaid Services, 2016, Peikes et al., 2016). However, these three definitions of CPC models organize the 12 constructs differently. Each definition contains between five and seven "functional domains," and each functional domain covers one or more constructs. Each functional domain, in turn, contains a set of capabilities (i.e., services a practice provides to its patients). As Table 1 shows, some of the definitions include constructs that others exclude; some functional domains and constructs appear to be similar but have different names; some of the functional domains include multiple constructs; and relationships between constructs, functional domains, and capabilities are inconsistent across the three overarching definitions.

For this project, we considered "comprehensive primary care" to be the union of the *capabilities* meeting these three definitions (i.e., the unduplicated list of capabilities that emerges from combining all elements of the three definitions). This approach was intended to offer CMS cost estimates for a broad range of capabilities that could plausibly be deemed "comprehensive primary care." As a consequence of this approach, we organized the resulting list of capabilities into constructs that were based on, but modestly differed with, each of the three source definitions (see Chapter Two for details).

It is important to distinguish the first construct in Table 1, "comprehensiveness," from "big-C" Comprehensive Primary Care (which describes two specific CMS programs: the CPC initiative and CPC+) and from the wider range of capabilities that constitute "comprehensive primary care." As a basis for describing specific primary care capabilities and their associated costs in this study, we defined "comprehensiveness" in accordance with Starfield's cardinal dimensions of primary care: the extent to which primary care practices can provide a broader range of services, thereby meeting a broader range of their patients' health needs within the practice, rather than making referrals to specialists for those services (Starfield et al., 2005). Thus, the practice capabilities that constitute comprehensiveness are a subset of all those considered to be deemed "comprehensive primary care" capabilities.

Identifying Which Costs to Measure

Marginal Versus Total Costs

CMS seeks to adequately reimburse primary care practices for the additional costs of providing comprehensive primary care capabilities relative to providing only the core primary care services covered by the MPFS. Thus, the purpose of this study is to estimate the *marginal* costs of each comprehensive primary care capability relative to a counterfactual of not having the capability; the purpose of the study is not to estimate the *total* costs of running a practice with

Table 1. Comprehensive Primary Care Constructs, Functional Domains, and Capabilities Within Three Common CPC-Related Definitions

Construct	PCMH-A Functional Domains	PCMH-A Capabilities	CPC+ Care Delivery Requirements: Domains	CPC+ Care Delivery Requirements: Capabilities	CMS Illustrative List: Domains	CMS Illustrative List: Capabilities
Comprehensiveness	None	None	Comprehensiveness and coordination	• Additional services in office (e.g., behavioral health)	None	None
Care coordination	Coordination of care across the medical neighborhood	• Tracking referrals • Care plans • Referral relationships with specialists • Post-discharge follow-up • Link to community resources • Information exchange with hospitals, ER, and specialists • Information about total cost of care	Comprehensiveness and coordination	• Using data to identify patient needs • Linkages to community resources • Referral relationships with specialists • Tracking utilization patterns • Post-discharge follow-up	Care management and coordination	• Care transition follow-up • Relationships with specialists
Care management	Risk-stratified care management	• Use of registries • Care management services	Care management	• Patient empanelment • Care plans • Care transition follow-up • Longitudinal and episodic-care management • Incorporation of patient preferences into care management	Care management and coordination	• Referral to community services
Risk stratification	Risk-stratified care management	• Risk stratification • Use of registries	Care management	• Risk stratification	Population health	• Tracking of patient utilization patterns

Table 1—Continued

Construct	PCMH-A Functional Domains	PCMH-A Capabilities	CPC+ Care Delivery Requirements: Domains	CPC+ Care Delivery Requirements: Capabilities	CMS Illustrative List: Domains	CMS Illustrative List: Capabilities
Population health	None	None	Planned care and population health	• Population-level assessment of care gaps	Population health	• Care transition follow-up • Performance measurement • QI activities • Tracking of patient access
Planned care	Planned care for chronic conditions and preventive care	• Registries • Care plans • Evidence-based guidelines • Care reminders • Non-physician team members • Medication reconciliation • Patient notification of care needs	Planned care and population health	• Evidence-based protocols • Team-based care	None	None
Continuity	Continuity of care	• Patient empanelment • Usual source of care	Access and continuity	• Trusting, continuous relationship with provider	None	None
Access to care	Access to care	• Use of patient's preferred mode of communication with providers • After-hours care • Phone and group visits	Access and continuity	• After-hours care • Alternatives to office visits	None	None

Table 1—Continued

Construct	PCMH-A Functional Domains	PCMH-A Capabilities	CPC+ Care Delivery Requirements: Domains	CPC+ Care Delivery Requirements: Capabilities	CMS Illustrative List: Domains	CMS Illustrative List: Capabilities
Direct medical care	None	None	None	None	Direct medical care and associated activities	• Office visits • Alternatives to traditional office visits • Consultation with specialists, with or without associated patient visits • Behavioral health integration • Collaborative team meetings • After-hours care
Patient and caregiver engagement	Patient and caregiver engagement	• Incorporation of patient preferences into planning • Shared decisionmaking • Patient-centered communication • Self-management support • Patient councils	Patient and caregiver engagement	• Patient councils • Care management support	Patient and caregiver experience and engagement	• Shared decisionmaking • Patient/caregiver councils • Patient surveys
Data analytics and quality improvement (QI)	Continuous improvement driven by data	• Performance reports • Staff for QI • Evidence-based quality assurance • Quality-based hiring	None	None	HIT/Data, analytics, continuous quality improvement	• Performance measurement • QI activities • Tracking of patient utilization patterns • Tracking of patient access

various comprehensive primary care capabilities relative to a counterfactual of shutting down the practice (i.e., incurring zero cost).

Direct Versus Indirect Costs

The marginal costs that practices incur to support comprehensive primary care capabilities can be classified as direct or indirect. For example, a direct cost of care coordination would be the time that a registered nurse spends calling specialists to request the transfer of patient records. Indirect costs are spread across multiple comprehensive primary care capabilities, and possibly across other practice operations, in a way that prevents apportioning them to a specific capability. Examples of indirect costs might include the costs of electricity, telecommunications, office supplies, heating, a building's rent or mortgage, and labor that aids an entire practice (e.g., cleaning services). Because indirect costs support more than one service or activity, practices might not routinely track the relationship of these costs to any particular comprehensive primary care capability.

However, the distinction between direct and indirect costs is fundamentally a question of accounting methods. A cost that one practice considers indirect (e.g., the cost of running a copy machine) might be considered direct by another (e.g., if the practice has a system where staff input personal identification and purpose codes before making copies).

The possibility of transforming indirect costs into direct costs by applying a different accounting method offers researchers an opportunity to estimate the costs of comprehensive primary care more precisely, measuring all costs as direct as opposed to applying a uniform indirect rate to certain cost categories (e.g., labor); this also keeps researchers from ignoring the possibility that other costs rolled up in the indirect rate might, in fact, be distributed unevenly across capabilities.

Startup Costs and Other Costs That Affect Multiple Years

By definition, startup costs occur only when a particular capability is first established. However, these startup expenditures make possible all future years of an ongoing capability and thus will likely affect multiple years of a practice's operation.

An important consideration when collecting startup-cost data is the fact that many startup costs were incurred long before the data-collection period. For example, if a primary care practice already had a well-established care coordination program, it may be difficult for respondents to accurately report the costs of implementing the program. In such cases, researchers must weigh the importance of startup costs against the relative accuracy of the reported data. If startup costs are a relatively small proportion of total costs, and the data are highly unreliable, researchers might consider not collecting or reporting those startup costs.

When startup costs do constitute a large percentage of costs, and when researchers are able to collect accurate data, the methods available for allocating these costs, or other large investments affecting multiple years, can be complex. If a study is attempting to estimate the total cost of

implementing comprehensive primary care capabilities over a specific, fixed time horizon (e.g., two years), then including startup costs involves simply adding them to the total cost. However, when a study attempts to estimate the annual or monthly cost of a program, allocating startup costs involves spreading them across multiple years.

Accounting Costs Versus Economic Costs

An important distinction also exists between accounting and economic costs. Accounting costs are the costs an organization actually pays, so they appear directly in financial records; economic costs include costs that do not appear on financial records but that nonetheless have value. Economic costs may include the value of lost leisure time for employees, for example, or the lost work that employees would be doing if not performing activities related to comprehensive primary care. Depending on the scope of the research question, researchers may wish to take into account economic costs that do not necessarily directly affect a provider organization's financial position.

The difference between accounting and economic costs has important implications for how a cost analyst accounts for time spent by salaried employees or nonpaid staff members such as volunteers. For example, much of the work involved in implementing comprehensive primary care functions could be performed on nights and weekends, outside of normal business hours. If staff members are paid hourly, the costs of this work would be borne by the practice as extra personnel expenses (thereby captured as accounting costs). But if staff members are salaried, the costs would instead be borne by the employee as a reduction in leisure time, which would not appear on the practice's balance sheet. This reduction in leisure time would represent an economic cost to the employee, but not an accounting cost to the practice. Alternatively, an employee may perform these activities in lieu of other tasks, producing an economic cost to the practice that would not be captured as an accounting cost. If the practice hired another staffer to backfill the foregone activity, however, this hiring would produce a balance-sheet entry.

While practices might be aware of accounting costs only, the economic costs of comprehensive primary care capabilities matter because they may affect the sustainability of primary care practices. If practices adopt new capabilities that impose high economic costs without corresponding high accounting costs—in the form of salary raises or the hiring of new staff, for example—they may see high rates of staff attrition and need to discontinue the new capability. Or, practices might be forced out of business because they are effectively underpaying current and future staff members relative to the marginal value of their leisure time or competing job opportunities. Failing to estimate economic costs can lead to cost estimates that are misleading, especially in the long run.

To estimate economic costs, researchers can estimate the total number of hours spent by staff on each activity and multiply these hours by staff members' hourly wages—regardless of whether they are paid extra for the activity. Similarly, nonpaid volunteer labor would not accrue

accounting costs for the practice but would incur economic costs to the volunteer, which can be estimated by asking what hourly wages would normally be paid for similar work and applying these imputed wages to all hours of volunteer labor.

Overview of Past Approaches to Cost Estimation for Comprehensive Primary Care

In this section, we review the methods used by eight studies that attempted to measure costs that practices incurred in delivering comprehensive primary care capabilities (Zuckerman et al., 2009; Nocon et al., 2012; Patel et al., 2013; Magill et al., 2015; Halladay et al., 2016; Martsolf et al., 2016; Shao et al., 2016; Fleming et al., 2017). To identify these eight studies, we used a directed reference mining approach. We first reviewed an Agency for Healthcare Research and Quality (AHRQ) report that described the approaches of AHRQ-funded projects that aimed to estimate the costs of medical home transformation (Wasserman et al., 2015). This review yielded five studies. We then mined the references of those five studies and used PubMed and Google Scholar to search for articles that cited those studies. We excluded studies that estimated costs incurred by a health plan on behalf of a practice, focused on care settings other than primary care practices, or estimated costs of a single or very limited set of comprehensive capabilities (e.g., QI alone), because such limited adoption was not consistent with the CPC programs developed by CMS.

How Studies Defined "Comprehensive Primary Care"

While we reviewed all eight studies within the context of the "Patient-Centered Medical Home" (PCMH), the capabilities examined in these studies were consistent with those of comprehensive primary care. The eight studies focused on the costs that practices incurred either by (1) becoming a PCMH and/or applying for PCMH recognition or (2) developing and maintaining comprehensive capabilities within the context of PCMH. Two studies estimated the costs of applying for National Committee for Quality Assurance (NCQA) Level 3 medical home recognition (Halladay et al., 2016; Fleming et al., 2017). The remaining studies focused on estimating the costs of developing and maintaining capabilities consistent with the PCMH model (Magill et al., 2015; Martsolf et al., 2016).

The studies that focused on developing and maintaining capabilities consistent with the PCMH model (Zuckerman et al., 2009; Nocon et al., 2012; Patel et al., 2013; Magill et al., 2015; Martsolf et al., 2016; Shao et al., 2016) used different approaches for determining which capabilities to count for the costing exercises. One study counted all capabilities that they determined to be consistent with the PCMH model, including enhanced access, population health management, increased care management, support for community resources, care coordination, quality and performance measurement and improvement, and expanded use of health information technology (Magill et al., 2015). A second study counted only those capabilities that were newly

adopted as part of a PCMH demonstration program, including care management, enhanced access, quality measurement, information technology, and other related capabilities (Martsolf et al., 2016). Two studies compared the annual operating costs at practices designated as PCMHs, either through NCQA accreditation or by the authors' determination, and those that were not. They did not collect information on the specific capabilities that qualified a practice as a PCMH. Further, one of those studies focused only on staffing-related costs (Patel et al., 2013).

Two other studies examined the association between a practice's "medical-homeness" and its expenses (Zuckerman et al., 2009; Nocon et al., 2012). These studies used composite measures of the extent to which practices adopted particular structural capabilities. Zuckerman et al. constructed a composite measure based on the nine medical home domains outlined in the NCQA Physician Practice Connection-PCMH standards: access and communication, patient tracking and registry functions, care management, patient self-management support, electronic prescriptions, test tracking, referral tracking, performance reporting and improvement, and advanced electronic communications. Nocon et al. constructed a composite measure based on six domains included in a survey sent to federally funded health centers: access/communication, care management, external coordination, patient tracking, test/referral tracking, and QI (Shao et al., 2016).

Marginal Versus Total Costs

All of the identified studies focused on the marginal costs of adopting and delivering comprehensive primary care capabilities, as opposed to the total costs.

Direct Versus Indirect Costs

All of the identified studies focused on the direct costs of comprehensive primary care capabilities. Only two studies included indirect costs in their calculations. These indirect costs were not attributed to any specific function or capability, however; neither were they explicitly measured. Instead, the authors compared all costs at practices with high scores on a medical-homeness scale to those that had lower scores on that scale (i.e., a top-down approach, discussed further in Chapter Two). These studies included all direct and indirect costs but did not estimate direct and indirect costs separately (Zuckerman et al., 2009; Nocon et al., 2012). In this way, the studies estimated all direct and indirect marginal costs associated with increased comprehensive primary care activities.

Startup Costs and Other Costs That Affect Multiple Years

Four studies estimated startup costs associated with adopting comprehensive primary care capabilities (Halladay et al., 2016; Martsolf et al., 2016; Shao et al., 2016; Fleming et al., 2017). The researchers typically conceptualized startup costs as one-time purchases or activities, such as the development of new processes, that were necessary to begin a transformation or intervention.

Accounting Costs Versus Economic Costs

Four studies focused on accounting costs. These studies did not count all of the hours that staff spent on comprehensive primary care capabilities but focused only on differences in overall budgets or practice costs (Zuckerman et al., 2009; Nocon et al., 2012; Patel et al., 2013; Shao et al., 2016). These were implicitly accounting costs because they represented costs that the organization actually paid—costs that would appear directly in financial records. Conversely, four studies collected economic costs, specifically the amount of time that staff members spent delivering comprehensive capabilities regardless of any changes in costs that appeared on financial records (Fleming et al., 2004; Magill et al., 2015; Halladay et al., 2016; Martsolf et al., 2016).

2. Methods

We used a mixed-methods approach to collect detailed data from primary care practices across the United States regarding their comprehensive primary care capabilities and associated costs. In this section, we describe the guiding principles for our approach, followed by the methods stemming from these principles.

We then describe the qualitative, frontline personnel interviews that were part of the study. These interviews aimed to validate the accuracy of labor-hour estimates and provide a more nuanced understanding of comprehensive primary care capabilities, including variations in how practices adopted and delivered them.

Overarching Design Decisions: Estimating the Costs of Comprehensive Primary Care Capabilities

The overarching design decisions for describing comprehensive primary care capabilities and their costs appear in the following sections. We made these decisions in consultation with the technical expert panel (TEP) for this study and the contracting officer's representative (COR).

Sample Practices for Diversity

This project aimed to develop a new method for estimating the expenses incurred by practices for their comprehensive primary care capabilities. To assess the method's performance among practices in a variety of settings, while constrained to a modest sample size of 50 practices (as appropriate to piloting a new method), we sampled practices for diversity rather than for national representativeness. We constructed a sample with diversity across CPC+ participation status, U.S. Census division, rural or urban location, practice size, and practice affiliation with parent organizations. Despite this diversity by design, the sample was too small to allow a meaningful test of statistical inference (e.g., between larger and smaller practices).

Use Bottom-Up Cost Estimation

We chose a bottom-up activity-based cost-estimation method (Mogyorosy and Smith, 2005). This approach identifies all of the individual labor and nonlabor expenses incurred to support a given comprehensive primary care capability, translates each expense into dollars (by multiplying labor hours by wages), and calculates the sum of these individual expenses. By considering each capability in isolation, bottom-up methods are well-suited to estimating both the startup and ongoing costs that practices incur on a capability-by-capability basis. The main drawbacks of a bottom-up approach are the costs of data collection (due to the data detail

required), the reliance on self-report of ongoing and past expenses, and the potential for double-counting labor hours and other expenses that support multiple capabilities. As discussed below, we sought to limit the risk of double-counting by computing total labor hours and by requesting clarification when labor hours were unrealistically high or when capability descriptions seemed to involve overlapping activities.

We did not use a top-down cost-estimation method for the following reasons: Top-down methods use regression models to infer the costs of a given capability by comparing the overall financial positions (i.e., net revenues) of practices that do and do not have the capability (Mogyorosy and Smith, 2005). These methods are unlikely to double-count expenses. However, top-down methods require much larger sample sizes than bottom-up approaches to generate cost estimates of individual capabilities (i.e., multiple observations per capability are needed to distinguish the net revenue impacts of each capability from every other capability and from potential confounders). Moreover, top-down methods require valid data on practice net revenues (i.e., those that are comparable across practices), which might not be available if practices vary considerably in their accounting methods (e.g., with some practices using cash accounting and others using accrual accounting). Without multiple years of financial reports that span the adoption of new capabilities, top-down methods also cannot estimate their startup costs.

Treat All Costs as Direct Costs

For the reasons mentioned in the Background chapter (mainly the possibility of introducing substantial imprecision in the costs of individual capabilities), we avoided applying a uniform indirect cost rate to the marginal cost estimates of comprehensive primary care capabilities. Instead, we sought to elicit and directly estimate, on an itemized, capability-by-capability basis, the expenses traditionally included as indirect costs—thus treating them as direct costs of each capability. For example, if a particular capability required additional office space, we sought to estimate the exact cost of this marginal increase in space (e.g., through construction costs, increased rent and utilities). We sought to separately estimate ongoing costs (incurred annually) and startup costs (incurred one time), rather than attempt to combine them.

Estimate the Costs of Comprehensive Primary Care Capabilities Provided to Any Patient

We sought to estimate the costs of capabilities provided to *any* patients, without restriction to particular patient populations. For CPC+ participating practices, we did not limit our definition of comprehensive primary care capabilities to those capabilities provided to Medicare beneficiaries; neither did we limit cost estimates to the Medicare beneficiary population. When calculating a practice's expenses on a per-patient basis for each capability, the denominator was the practice's entire patient panel, rather than just the patients who received the capability. Similarly, we calculated capability expenses on a per-full-time equivalent (per-FTE) basis using each practice's total primary care provider FTEs, rather than just the fraction of FTEs devoted to patients who received the capability.

Collect Data Using Practices' Descriptions of Their Own Specific Capabilities, Rather Than Forcing Practices to Use Standardized Capability Descriptions

As described in the Background chapter, we sought to estimate the costs of all practice capabilities in the union (i.e., the unduplicated merged list) of comprehensive primary care capabilities displayed in Table 1. These 36 capabilities plus three cost categories (hereafter designated as "standardized capabilities" and organized into groups) are listed and defined in Table 2. These definitions, developed by the study team, CMS project sponsors, and the study TEP, are drawn from previous research on primary care capabilities and their costs (Starfield et al., 2005; Martsolf et al., 2016) as well as from PCMH recognition criteria (National Committee for Quality Assurance, 2014), but they are not identical to any previously published set of definitions.

Table 2. Standardized Comprehensive Primary Care Capabilities

Standardized Capability Group	Standardized Capability	Definition
Care management	Appointment assistance	Practice helps patients make appointments with subspecialists outside the practice, reminds them of scheduled appointments with subspecialists or the primary care practice itself, helps arrange transportation to appointments, and/or helps reschedule any appointments that were canceled or missed.
Care management	Home health management	Practice helps patients access home health services and serves as the practice's primary point of contact for home health providers.
Care management	Patient education and self-management support	Practice provides health education resources to patients, assists patients with self-management tools to develop and document plans and goals, helps identify barriers to self-care, documents self-management abilities, or advises patients and their families on adopting healthy behaviors.
Care management	Medication management	Practice performs medication management, which might include reviewing and reconciling medications (including over-the-counter medications and supplements), providing information about new medications, assessing patient/family understanding of medications, assessing patient response to medications, and addressing barriers to adherence.
Care management	Team huddles	Practice has teams that huddle to discuss upcoming scheduled patients, usually for later that day. These huddles might be times when teams identify special needs or concerns and plan the day or clinic session.
Care management	Written care plans	Practice makes written care plans for some or all patients. At least a subset of providers (including, but not limited to, care managers) then use these plans to guide patient care. Care plans document information beyond what is required for FFS billing and are generally separate from visit notes.
Care management	Previsit planning	Practice conducts previsit planning: a regular review of upcoming patient visits to ensure that protocol-driven tasks are done. These tasks might include lab tests, specialty consults, and procedures.

Table 2—Continued

Standardized Capability Group	Standardized Capability	Definition
Care management	Care management for high-risk patients	Practice provides care management services to patients considered high-risk for poor health outcomes or high costs of care. This includes care management for patients with chronic conditions.
Care management	Transitional care management	Practice provides transitional care management to facilitate patient transfer from inpatient to ambulatory settings.
Care management	Other care management	Practice provides a care-management capability not otherwise categorized.
Empanelment	Empanelment	Practice assigns patients to primary care practitioner (PCP) panels or PCP-led teams.
Care coordination infrastructure	Service agreements	Practice has formal service agreements with subspecialists, hospitals, community resources, or other outside providers that specify how information will be shared with the practice. Such agreements might include guarantees about how soon patients will be seen after referral or specify a certain period of time in which the practice will receive information back from the subspecialist or hospital.
Care coordination infrastructure	Community service lists	Practice maintains a list of community services (e.g., programs or classes for smoking cessation, weight loss, parenting, fall prevention) to share with providers, patients, and family members.
Care coordination infrastructure	Software-based communication infrastructure	Practice uses electronic health records (EHRs) or other software that can communicate with subspecialists, hospitals, laboratory and imaging services, community resources, or other outside providers. This does not include patient portals.
Care coordination infrastructure	Other communication infrastructure	Practice uses infrastructure other than software to facilitate communication with outside providers. Such infrastructure might include staff and equipment to manage faxes, phone calls, and mail.
Care coordination infrastructure	Other care coordination infrastructure	Practice has a care-coordination infrastructure not otherwise categorized.
Comprehensiveness	Geriatric care	Practice provides enhanced or dedicated geriatric services.
Comprehensiveness	Behavioral health	Practice provides enhanced or dedicated behavioral health services.
Comprehensiveness	Other expanded services	Practice offers expanded services not otherwise categorized (i.e., services beyond those considered typical primary care services).
Continuity	Home visits	Practice personnel provide in-person care to patients in patients' homes.
Continuity	Hospital visits	Practice personnel provide in-person care to their hospitalized patients.
Continuity	Other external visits	Practice personnel provide in-person care to their patients in other locations outside the practice.
Continuity	On-call system	System for handling incoming messages from patients or outside providers when practice is closed.

Table 2—Continued

Standardized Capability Group	Standardized Capability	Definition
Enhanced access	Same-day or next-day office visits	Practice has dedicated appointment slots for same-day or next-day office visits.
Enhanced access	Extended hours	Practice offers office visits before or after typical business hours or on weekends.
Enhanced access	Patient care other than office visits	Practice offers modes of patient care that substitute for office visits (e.g., via telephone or internet). For example, e-visits via patient portal might substitute for face-to-face office visits.
Enhanced access	Other enhanced access	Practice provides enhanced access capability not otherwise categorized.
Planned care and population health	High-risk patient lists	Practice has a system or registry that generates lists of patients (population view) considered high-risk for poor health outcomes or high costs of care.
Planned care and population health	Preventive or overdue care lists	Practice has a system or registry that generates lists of patients (population view) that are overdue for preventive or chronic disease-management services.
Planned care and population health	Performance measurement	Practice regularly measures and tracks costs of care, quality, utilization, patient experience, or access for its patient population. This might include numerators, denominators, and other summary statistics but does not need to be a list of individually named patients.
Planned care and population health	Performance improvement	Practice conducts performance-improvement activities targeting cost, quality, utilization, patient experience, or access for its patient population. These activities might include having a performance-improvement team, reporting performance back to PCPs, instituting care reminders, doing trainings, or hiring consultants.
Planned care and population health	Other planned care and population health	Practice has planned care and population health capabilities not otherwise categorized.
Patient and caregiver engagement	Shared decisionmaking	Practice has a system or initiative for incorporating patient preferences into care delivery (e.g., formal shared decisionmaking programs, use of decision aids, or decision coaches for patients).
Patient and caregiver engagement	Patient surveys	Practice conducts patient surveys or receives and reviews patient survey data. These surveys might measure patient experience or satisfaction.
Patient and caregiver engagement	Patient and family advisory council (PFAC)	Practice has a PFAC that meets with practice leaders or staff on a regular basis.
Patient and caregiver engagement	Other patient and caregiver engagement	Practice has patient and caregiver engagement capabilities not otherwise categorized.
Interpreter services[a]	Interpreter services	Practice arranges language interpretation services, when needed. Such services could include professional interpreters (on- or off-site) or informal interpreters (e.g., practice staff or family members).
Administrative activities[a]	CPC or PCMH administrative activity	Administrative activities that are conducted to meet CPC or PCMH program or certification requirements but that do not directly affect patient care (e.g., preparing financial or performance reports solely to meet program requirements).

Table 2—Continued

Standardized Capability Group	Standardized Capability	Definition
Administrative activities[a]	Other administrative activity related to comprehensive primary care	Practice performs administrative activity related to comprehensive primary care that is not otherwise categorized (e.g., pay-for-performance measures the practice must report to a payer).

[a] Unlike the other standardized capabilities in Table 2, interpreter services and administrative activities did not fall within the union of comprehensive primary care capabilities displayed in Table 1. These capabilities were added in consultation with the COR and TEP because they are related to comprehensive primary care capabilities and incur practice expenses.

However, we also sought to develop a method that could address a persistent question in estimating the costs of practice capabilities: When practices report widely divergent costs for a given *standardized* comprehensive primary care capability (e.g., medication management), to what extent does the cost difference stem from different prices for the same capability, as compared to stemming from the practices having substantially different capabilities? Without detailed descriptions of each capability, this question cannot be answered empirically.

We therefore took a qualitative, interview-based approach to collecting descriptions of practice capabilities. We recorded capability descriptions as reported by practice leaders rather than asking yes/no questions about their use of standardized capabilities on the prespecified list. Because the standardized capabilities on this list include jargon that is unlikely to have a shared understanding across practices, we also did not ask practice leaders to match their own capabilities to the standardized capability list. Instead, RAND study staff assigned each practice-reported capability to one or more standardized capabilities after data collection was complete. If a practice-reported capability did not map to one or more standardized capabilities, this capability was considered out of scope.

To avoid distorting capability descriptions given by practice leaders, we allowed multiple standardized capabilities to be assigned to a given practice-reported capability rather than asking practice leaders to divide their capabilities in ways unnatural to them. Similarly, when collecting cost data, we elicited expenses for each practice-reported capability rather than asking practices to apportion these expenses to standardized capabilities. Moreover, when a practice-reported capability supported both standardized comprehensive primary care capabilities and other activities (e.g., practice operations such as billing), we did not ask practices to estimate the portion of expenses devoted *only* to the comprehensive primary care capability. Such apportioning would require practice leaders to understand the standardized capability jargon and introduce error by forcing them to guess about resource allocations they might not be able to observe. For example, we did not ask practice leaders to divide up a complex capability that the practice views as one capability—such as a dedicated team that maps to three standardized capabilities (medication management, home visits, and high-risk care management)—into its constituents. Neither did we ask practices to guess how much electronic health record (EHR)

costs can be justifiably apportioned to care coordination rather than to the many other tasks performed by EHR—including some that are not comprehensive primary care capabilities. In such cases, we estimated the entire marginal cost of the capability (e.g., the cost of the EHR, if there was no separable cost for the care-coordination module) and noted this in the detailed description of the capability.

Estimate the Marginal Costs of Comprehensive Primary Care Capabilities, Net of Any Marginal Revenues Received

We estimated the marginal net costs of a practice having each comprehensive primary care capability compared to the counterfactual of not having the capability. Importantly, marginal cost estimates encompass only the costs of each capability on its own—not the total costs of running a primary care practice (for which the counterfactual would be to shut down the entire practice). When a practice-reported capability generated no FFS revenue, net marginal costs were equal to gross expenses for the capability. But when a practice-reported capability did generate FFS revenue, we sought to estimate the revenues and use them to calculate net costs. We recorded capabilities that did not generate a net loss for the practice as incurring zero marginal net cost.

For example, if a practice provided home visits and billed for them, we separately calculated the expenses incurred in conducting home visits (e.g., labor, transportation, equipment), along with the revenues they produced, and then took their difference. If a practice provided same-day or next-day office visits and billed for them (just as the practice would for any other office visit), we assumed equal revenue across visit types (since the MPFS does not distinguish between last-minute visits and those booked weeks in advance). Therefore, the marginal costs of same-day or next-day office visits were the *extra* expenses of providing them, relative to the expenses of other visits. These extra expenses might include the costs of unfilled same-day or next-day slots (i.e., the costs of keeping the practice open and staffed during these slots but not being able to bill for them). Similarly, the extra expenses of expanded hours (e.g., nights, weekends) might include paying staff overtime.

Practice Sample: Estimating the Costs of Comprehensive Primary Care Capabilities

The sampling strategy was designed to produce a diverse sample of 50 primary care practices from across the United States. Sample practices had to have already adopted, at a minimum, a set of comprehensive primary capabilities that met care-delivery requirements for participation in the CPC+ program. In this section, we describe the sample frames, eligibility criteria, and sampling approach.

Sample Frames and Eligibility Criteria

We drew primary care practices from two sample frames. The first frame was a database provided by CMS of all 4,344 practices that applied to participate in CPC+ (including both those selected and those not selected for the program). The second was the 2013 SK&A database of physician practices, from which we identified all practices with a practice-level specialty of primary care and all multispecialty practices with at least one physician designated as practicing primary care, resulting in 77,386 practices total. SK&A is a commercial market research firm that maintains data sets of office-based health care providers; data are updated twice yearly via telephone verification (SK&A, 2018). Before contacting practices drawn from the SK&A sample frame, we obtained their updated contact information (as of 2017) from SK&A.

To be eligible for sampling, we required practices to meet CPC+ care delivery requirements. For the CPC+ applicants, practice-level data on their eligibility requirements were available from the CMS database. We then excluded any practices that were Federally Qualified Health Centers (FQHCs) or Rural Health Centers (RHCs), because FQHCs and RHCs are paid via methods different from the MPFS, and those that did not bill Medicare FFS (e.g., direct pay practices). There were 1,017 CPC+ applicants that did not participate in CPC+ yet met eligibility requirements for our study.

However, the SK&A database did not include data on our eligibility requirements. Therefore, we used a screener survey to assess the eligibility of practices sampled from the SK&A database. The screener survey asked a leader of each sampled practice to indicate whether the practice was an FQHC or RHC and whether the practice met each of the CPC+ care-delivery requirements: (1) the practice assigns patients to specific practitioner panels, (2) non-physician team members have a more-than-limited role in providing patient care, (3) the practice performs follow-up with patients seen in the emergency department (ED), (4) the practice offers patients after-hours access (24 hours, 7 days a week) to a physician, physician assistant (PA), nurse practitioner (NP), or nurse via an answering service or through direct contact, (5) the practice performs QI activities, and (6) the practice has available staff, resources, and time for QI activities.

To complete the screener survey, we called each sampled practice via telephone to identify a practice leader and verify his or her contact information. We then conducted up to three waves of mailed surveys and telephone calls with each practice, to prompt completion. We offered an incentive of $100 to each practice that completed the survey.

Sampling Approach

We designed a sampling strategy to produce a stratified sample of approximately 50 practices that were diverse on the following dimensions: CPC+ participation status, Census division, urban or rural status, practice size, and affiliation with a parent organization.

We divided CPC+ participation status into four categories: (1) practices participating in CPC+, (2) practices located in CPC+ regions that applied but that were ineligible to participate

in CPC+ for reasons other than those in our eligibility criteria, (3) practices located in CPC+ regions that were eligible to participate in CPC+ based on our eligibility criteria but did not apply (including both those that did and those that did not participate in the original CPC demonstration), and (4) practices located outside CPC+ regions that would have otherwise been eligible for CPC+ based on our survey-eligibility criteria. We chose these four categories because the adoption and level of investment of practices in comprehensive primary care capabilities might be affected by their participation in CPC+ and also might vary with their propensity to apply to the CPC+ model.

We determined Census divisions by mapping the location state of each practice to the corresponding Census division.

To determine urban or rural status, we mapped the zip code of each practice to its Rural Urban Commuting Area (RUCA) code. This crosswalk was created by the Center for Rural Health at the University of North Dakota (Center for Rural Health, 2014) using 2010 Census work-commuting data, the 2012 Census Bureau urban-area definition, and 2013 zip codes. We defined "rural" as RUCA > 3 (i.e., an area more rural than "Metropolitan area low community: primary flow 10 percent to 30 percent to urban area"), following the Federal Office of Rural Health Policy definition of rurality (Health Resources and Services Administration, 2017).

We defined "practice size" as the count of PCPs in the practice (using the headcount, not FTEs)—which is a common and longstanding approach to assessing practice size using secondary data only (Casalino et al., 2003; Friedberg et al., 2007; Friedberg et al., 2009). In previous research, we have found that the costs incurred by practices adopting comprehensive primary care capabilities varied by practice size (Martsolf et al., 2016).

We defined "affiliation with a parent organization" as ownership of the practice by a hospital, university, or health system or an exclusive relationship between the practice and a larger entity (e.g., an independent practice association [IPA] or network) that shared financial risk and supplied resources such as shared staff or capital equipment (Friedberg et al., 2007). In previous studies, we have found that health-system affiliation also is associated with physician practice costs (Martsolf et al., 2016).

Table 3 presents the number of desired practices in each sampling dimension. The desired distribution of practices across CPC+ regions (which was our first priority) resulted in a somewhat uneven distribution of practices across Census divisions. We crossed these five dimensions to produce a sampling table and chose practices at random within each sampling cell, initially sending one invitation per desired participant and broadening the sample to two or three invitees per desired participant toward the end of the sampling period (due to delays in data collection, as discussed in Chapter Three).

Table 3. Composition of Desired Practice Sample

Sampling Dimension	Value	Desired Number of Practices
CPC+ participation status	Practices participating in CPC+	20
CPC+ participation status	Practices located in CPC+ regions that applied but that *were ineligible* to participate in CPC+ for reasons other than our survey eligibility criteria	5
CPC+ participation status	Practices located in CPC+ regions that *were eligible* to participate in CPC+ based on our eligibility criteria *but did not apply*	5
CPC+ participation status	Practices located outside CPC+ regions that would have otherwise been eligible for CPC+ based on our eligibility criteria	20
Census division	New England	4
Census division	Middle Atlantic	8
Census division	East North Central	9
Census division	West North Central	3
Census division	South Atlantic	9
Census division	East South Central	4
Census division	West South Central	5
Census division	Mountain	3
Census division	Pacific	5
Urban or rural status	Urban	40
Urban or rural status	Rural	10
Practice size	1 PCP	12
Practice size	2–3 PCPs	13
Practice size	4–9 PCPs	13
Practice size	10 or more PCPs	12
Affiliation with parent organization	Affiliated	25
Affiliation with parent organization	Not affiliated	25

Instrument Development: Estimating the Costs of Comprehensive Primary Care Capabilities

To elicit descriptions of practices' comprehensive primary care capabilities and collect data on their costs, we designed two data-collection tools: a semi-structured interview guide and a customized cost-reporting workbook for each practice. We developed these instruments in consultation with the CMS COR and the project TEP.

Concerned that a self-administered written survey would produce lower-quality data, we opted instead for a mixed-methods approach using these two instruments in sequence. Our environmental scan showed that all of the extant surveys that collected primary care practice

cost data were researcher-administered using an interview approach (with or without an electronic data-collection tool). Our TEP members, who had experience in collecting practice cost data, also expressed significant concerns about collecting data using an online tool. RAND researchers on the project team who had experience collecting cost data from primary care practices (Martsolf et al., 2016) had learned from these earlier projects that it was very difficult for practices to report these costs without significant researcher assistance via telephone. Finally, a self-administered tool would require much more detailed instructions and a much more sophisticated design (with built-in features to detect erroneous entries) to help respondents complete the questions.

Semi-Structured Interview Guide

The interview guide, available in the Appendix, was designed for a 90-minute semi-structured interview with one or more practice leaders. The interview guide included questions about practice staffing and governance, the relationship with the parent organization (if applicable), and team structure, followed by questions designed to elicit detailed descriptions of capabilities within each standardized capability group listed in Table 2. For each capability, the guide contained prompts to elicit descriptions of the *types* of expenses incurred (e.g., explanations about which personnel might devote effort to it or which nonlabor expenses arose); interviewees were not asked to quantify these expenses, however (i.e., neither labor hours nor cost amounts were elicited).

Cost-Reporting Workbook

Before conducting any semi-structured interviews, we developed an Excel workbook template that contained data-entry fields for practice FTEs in each personnel category (e.g., physicians, nurse practitioners [NPs], physician assistants [PAs], nurses, medical assistants [MAs]); average costs per unit of labor in each personnel category (including annual or hourly wages plus benefits); and work hours that the practice considered full time in each personnel category (i.e., hours per week, weeks per year). For each comprehensive care capability, the workbook also queried ongoing (weekly or monthly) labor hours and nonlabor costs, intermittent labor hours and nonlabor costs (happening every year, but less than monthly), and startup labor hours and nonlabor costs (happening once, when the capability was adopted).

The workbook template was designed to be customizable to the data gathered in each semi-structured interview (i.e., after completion of the interview). Customizable areas included personnel categories, descriptions of comprehensive primary care capabilities (using the practice's preferred nomenclature for each capability), and types of expenses (via highlighting cost cells in which entries were expected). For example, if practice leaders reported having a capability called the "high-need hospital-to-home-visit service" and this capability involved labor from the clinic manager, an NP, a clinical pharmacist, and an administrative assistant, as well as a special EHR module that the practice would not have otherwise purchased, that

practice's customized workbook would include a row labeled "high-need hospital-to-home-visit service" and have highlighted cells indicating where to enter the estimated number of work hours devoted by the clinic manager, NP, clinical pharmacist, and administrative assistant to this capability. The customized workbook would also collect hourly-wage-plus-benefits information for each of these staff categories and have a highlighted cell on a nonlabor tab indicating where to enter the cost of the special EHR module. If any one-time startup costs (e.g., labor time devoted to training) were mentioned in the semi-structured interview, the customized workbook also highlighted cells for these.

As a data-quality check, for each category of practice personnel, the workbook computed the total hours reported as being devoted to comprehensive primary care capabilities and compared these hours to total practice FTEs. This step helped respondents identify potential double-counting of labor hours across comprehensive primary care capabilities, which might result in their computed total hours exceeding total FTEs.

For all practices, the workbook also elicited estimates of the size, racial and ethnic composition, and payer mix of the practice's patient panel. The workbook asked for the standard lengths of annual physicals, follow-up office visits, and urgent office visits, both for new and established patients. Finally, the workbook requested an estimate of the marginal costs of performing one additional established-patient office visit (i.e., keeping the practice open just long enough for one PCP, assisted by usual support staff, to provide one more such visit). This final question, though not related to any comprehensive primary care capability, was requested by CMS to get a rough estimate of the marginal costs that a practice incurs to perform a single office visit.

Data Collection: Estimating the Costs of Comprehensive Primary Care Capabilities

We began data collection with four pilot practices in July 2017 and, thereafter, made edits to the wording, sequence, and structure of the interview guide and cost-reporting workbook to improve the clarity and flow of items. We then started recruiting the remaining practices in September 2017. Data collection concluded on June 28, 2018.

Because researchers collected data on organizational operations, the investigators and RAND's Human Subjects Protection Committee deemed all research components as "not human-subjects research."

Recruitment

After calling to confirm the name and contact information of the practice leader, we mailed each sampled primary care practice up to three rounds of invitation letters via FedEx (supplemented by emailed invitations, when email addresses were available), followed by up to three rounds of telephone prompts. We offered each practice an incentive of $3,750 to offset the

time and effort its participation would require. The incentive amount was based on a rough estimate of how many hours data collection would require of practice leaders, multiplied by their estimated earnings per hour, with an intent to err on the high side to incentivize participation.

Data Collection

Data collection proceeded in three steps. First, we conducted semi-structured interviews with practice leaders to gather data on capabilities. Second, using the cost-reporting workbook customized to each practice, we gathered data from practice leaders (via telephone or email) regarding the cost of the capabilities reported in the first step. Third, in a final telephone call, we presented practice leaders with a practice-specific summary of their costs and capabilities for their approval.

The 90-minute semi-structured interviews were performed by one or more lead interviewers and one notetaker via telephone. Interviewees were one or more practice leaders who had knowledge of practice capabilities and finances. For practices affiliated with parent organizations, we sought to include representatives of the practice and the parent organization in the same interview. When this was not possible, we conducted both practice-level and parent-organization-level interviews. All interviews were digitally recorded and transcribed with interviewee consent.

We used interview notes and transcripts to create the cost-reporting workbooks, which were reviewed by the lead interviewer and project director before being sent to the practices, along with an instruction guide. The workbooks included only those capabilities that incurred a net cost to the practice (i.e., that either could not be billed as FFS or for which the practice's expenses exceeded FFS revenues). Capabilities that were planned but not yet in use at the practices were excluded from the workbooks.

Based on the experience with the pilot practices, we asked all practices to preview the workbook to determine which data they would need (e.g., expense reports, personnel files) to complete it. However, we encouraged practices not to complete the workbook on their own. Rather, we recommended they schedule a second 90-minute interview, during which RAND investigators would complete the workbook based on information that the practice provided via telephone. This approach allowed practices to report expenses in a format natural to them (e.g., without requiring the practice to calculate per-week labor hours if they didn't think of labor in this way) and allowed RAND investigators to quickly explain any unclear items and clarify any ambiguities in the data received (e.g., whether labor hours were being reported on a per-individual basis or for all individuals in a given personnel category). After each workbook-completion call, we emailed each practice a list of any estimates still needed.

For complex capabilities like EHRs, which supported multiple capabilities (as well as functions other than comprehensive primary care), we attempted to isolate the costs attributable to comprehensive primary care capabilities. For example, if an EHR was used to generate performance reports, we asked whether having the performance report functionality incurred a

cost beyond the EHR base-product functionality. When such marginal costs could be identified, we asked practices to report them.

When parent organizations incurred expenses on behalf of their practices, we asked organizational leaders to apportion a share of these expenses to the specific practice sampled. In some cases, this was straightforward, for example, for organizational employees who spent a known number of hours in the practice of interest. In other cases, organizational leaders provided organization-level costs, and we apportioned them to the practice of interest based on its size relative to the group of practices also using the capability. However, when organizational capabilities were shared between practices of different specialties or with hospitals, no attractive apportionment method existed.

When a practice was unable to provide wage or salary data, we imputed wages and salaries using Bureau of Labor Statistics (BLS) profession-matched wage and salary data from the same metropolitan statistical area (MSA) as the practice. If a practice was not located in an MSA or was in an MSA for which the BLS lacked data, we used state-level BLS data instead. We did not impute any other cost data. If a practice reported that a capability incurred costs but could not estimate them (e.g., when a parent organization could not apportion a capability to the particular practice of interest), we recorded the capability cost as "unknown."

We then created a detailed cost summary for each practice, based on its completed workbook. The summary document, shared only with the practice leaders who participated in the interview and workbook-completion call, reported average labor costs per hour in each personnel category, capability costs per year (with labor and nonlabor breakdowns), and capability costs both per FTE PCP and per patient.

On a final 30-minute call, we discussed the cost summary, solicited any corrections from the practice, and sought the practice's approval of the summary (i.e., agreement that it had face validity) if no corrections were needed. If BLS wage and salary data were used in a practice's cost summary, we asked practice leaders whether these BLS data were reasonable approximations of the wages and salaries earned by practice staff. Investigators also sought clarification of any remaining concerns over the accuracy of the cost data (e.g., if labor hours seemed unrealistically high—possibly due to double-counting—or when capability descriptions seemed to involve overlapping activities). Wherever we had imputed wage or salary data, we asked if the imputed data were approximately correct. If corrections were needed, we sent a corrected cost summary to the practice and sought approval via email.

Data Analysis: Estimating the Costs of Comprehensive Primary Care Capabilities

We performed descriptive analyses in two stages. First, we assigned standardized capabilities (listed in Table 2) to each of the practice-reported capabilities, allowing assignments per practice-reported capability as appropriate (e.g., in the case of practice-reported capabilities that

had multiple components). The lead interviewer and notetaker for each practice performed these assignments, and the project director reviewed these assignments, making edits until all parties (the interviewer, notetaker, and project director) agreed that the assignments were correct based on the definitions in Table 2.

Second, we calculated the total annual costs and total startup costs for each practice-reported capability, as well as the labor and nonlabor components of these costs. To standardize across practices of different sizes, we then divided the total costs by two denominators: the number of FTE PCPs in the practice and the number of patients in the practice's panel. Because many practices indicated substantial uncertainty about their patient-panel sizes but little uncertainty about their FTE PCPs, we chose FTE PCPs as the main denominator for data presentation in Chapter Four and the Appendix.

For all of the practice-reported capabilities assigned to a given standardized capability, we calculated the minimum, twenty-fifth percentile, median, seventy-fifth percentile, and maximum costs per FTE PCP. We allowed multiple observations per practice, since a given practice could have more than one practice-reported capability assigned to a given standardized capability (e.g., when a practice had two or more capabilities that provided medication management). We then created graphical displays of these data, organized by standardized capability. To give readers a sense of why costs varied within the same standardized capability, we reported detailed descriptions of the practice-reported capabilities at the minimum, twenty-fifth percentile, median, seventy-fifth percentile, and maximum costs per FTE PCP.

We included data from the pilot practices in all analyses.

Data Analysis: Identifying Clusters of Capability Adoption

To inform potential decisions regarding payment programs involving groups of capabilities that practices might adopt together (i.e., as part of a set, rather than a la carte), CMS requested a supplemental "cluster analysis" of practice capabilities. In this analysis, we sought to determine whether certain sets of standardized capabilities tended to be implemented together (i.e., in clusters) and, if so, whether different clusters of capabilities tended to be implemented by distinguishable clusters of practices. We explored three analytic methods to answer these questions.

First, we used principal components analysis (PCA) to test whether standardized capabilities were correlated in a manner indicative of an underlying latent construct (e.g., because they all were produced when a practice pursued a broad improvement program). These models generally should produce fewer inferred variables to explain a larger amount of the variation—if PCA describes the data well. In our sample, the PCA approach did not produce a model that fit the data well: the model required six principal components to represent 50 percent of the original variance in the data, and the first principal component explained only twice as much variation as the second (implemented in R with "prcomp") (Venables and Ripley, 2002; R Core Team, 2017). These findings suggest there are not a few underlying continuous variables, such as participation

in a broad improvement program (or culture, leadership, financial position, etc.) that underlie and determine the variation in practice capabilities. Because the PCA model fit was poor, we proceeded to the next two methodological approaches.

The second method we used was a hierarchical cluster analysis to test whether capabilities were implemented in a stepwise, path-dependent fashion such that capability A tended to be implemented first, then capability B, then capability C, and so on (implemented in R with "hclust") (Legendre and Legendre, 2012; R Core Team, 2017). To implement this cluster analysis, we first constructed a matrix of pairwise distances between capabilities using the Manhattan distance metric (i.e., "city block" distance: the absolute sum of differences between the two sets of binary 0/1 variables representing the absence or presence of a given standardized capability) (Kaufman and Rousseeuw, 1990). The hierarchical analysis fit the data reasonably well but produced many short paths after an initial split, suggesting that most of the variation in capability implementation was nonhierarchical. In other words, this second cluster analysis did *not* find evidence that capabilities were implemented in a stepwise or path-dependent fashion.

Thus, we used a nonhierarchical cluster approach as the third method to test whether there was a partitioning of the capabilities and practices into qualitatively discrete sets that were not representative of underlying continuous variables or hierarchical patterns. This method sought to describe the data as a collection of non-nested (nonhierarchical) mathematical sets of the capabilities.[1] We searched iteratively for anywhere from one to 15 clusters using this approach (R function "pamk" in package fpc) (Hennig, 2015). The best nonhierarchical model, which identified two clusters of capabilities and two clusters of practices, fit the data well (with a correlation of 0.7 between the original distances and cluster membership) and had the advantage of being parsimonious and therefore more easily interpretable, as presented in Chapter Four.

There is no gold standard for how high the correlation of cluster memberships to original distances should be, in part because this correlation will always be "statistically significant." The correlation is instead regarded as a description of how well the cluster memberships represent patterns in the original data. Especially considering that some of the original patterns likely reflect random measurement imprecision, a correlation of 0.7 suggests that the two-cluster non-hierarchical solution was appropriate to the pattern of capability adoption within our sample.

[1] Technical information: We used a nonhierarchical k-clustering approach called k-medoids (which is similar to k-means clustering but preferred for smaller data sets with mixed qualitative-quantitative variables) to test whether there was a partitioning of the capabilities and practices into qualitatively discrete sets that were not representative of underlying latent constructs or hierarchical patterns. This approach sought to describe the data as a set of non-nested (nonhierarchical) mathematical sets of the capabilities. K-clustering accepts a distance matrix as input (we again used the Manhattan distances) and tries to minimize the distances within the cluster while maximizing the distances between them.

Practice and Interviewee Sample: Frontline Personnel Interviews

The purpose of frontline personnel interviews at a subset of practices that previously completed cost-reporting workbooks was to: (1) validate the workbook data, (2) gather additional nuance as it related to the capabilities, and (3) explore implementation pathways. We present findings for the first goal above in Chapter Four and findings for the remaining two goals in Chapter Five (as well as in the Appendix). The focus of the interviews was care management (the entire domain) and behavioral health (within the comprehensiveness domain). In total, we conducted 32 frontline interviews with personnel at nine practices; however, not all participants were involved in every capability. Any one capability had between two and 11 personnel who participated (a median of six capabilities per frontline personnel interview). Thus, these interviews are hypothesis-generating. Their goal is to provide additional insight regarding the limitations of the methods used in the cost-reporting workbook; they also aim to further illuminate how the organization and implementation of select capabilities may account for differences in the intensity and costs of those capabilities.

Practice Selection and Recruitment

We interviewed frontline personnel from nine out of the 50 practices that completed cost-reporting workbooks (see Chapter Three). Eligible practices were those that had capabilities within the following two areas: care management (the entire domain) and/or behavioral health (within the comprehensiveness domain). We chose these capabilities because they have significant recurrent labor components. Nonlabor components can more easily be estimated (e.g., via invoices), whereas labor categories are at higher risk for reporting errors. Categories with significant labor components are thus good candidates for validation testing.

Once the cost summary was sent to the practice for review, practices with the capabilities of interest in these frontline personnel interviews were eligible for an invitation to participate in this data-collection phase. The first 24 practices to complete the costs data collection were considered for the frontline personnel interviews. Practices that completed the process later were not considered, as there likely would not have been enough time to complete the analysis of the interviews before the end of the project. Because two out of the three frontline personnel nominated by one participating practice did not respond to our repeated attempts to schedule an interview, we added another practice to our list of those eligible for invitation, resulting in a total of 25 eligible practices. While added later, this practice had progressed quickly through the cost-reporting workbook process (and they provided capabilities of interest), so we anticipated that it would be able to complete frontline interviews before the end of the project.

Six of the 25 eligible practices were not invited for one of two reasons: (1) they had been slow to respond in the cost-reporting workbook process and thus might be equally slow in participating in frontline personnel interviews, or (2) they offered only a few capabilities of interest, and given the small sample size for frontline personnel interviews, we wished to find

practices with a wider range of experiences. Six of the practices that we invited to participate in frontline personnel interviews declined. Reasons given included a transition in ownership, uncertainty regarding the legal ability of staff to receive compensation (paired with a desire for compensation should they participate), and the general feeling that the practice could not take on more work at the moment. Another four practices did not respond to recruitment attempts. Nine practices agreed to participate.

Recruitment consisted of an initial personal invitation, which we sent via email to practice leaders who had completed cost-reporting workbooks. Thereafter, we sent a series of follow-up emails and telephone calls as necessary. The invitations asked the practice whether it would be willing to allow its staff to be interviewed, and if so, to identify individuals for interview.

The sample of practices obtained for frontline interviews contained a diverse set of practices, in terms of both the combination and number of capabilities found at any one practice and in terms of contextual characteristics (i.e., CPC+ participation, geographic region, and practice size, as reported below). We deemed this level of variation to be sufficient for the aim of this portion of the project. We did assess degree of representativeness by comparing characteristics of this sample to those of the practices for whom cost-reporting workbooks were prepared.

In our sample, the practice with the smallest set of capabilities relevant to frontline personnel interviews had four capabilities. The practice with the largest set of relevant capabilities had nine capabilities. Participating practices had the following capabilities of interest to the frontline personnel interviews: 7 practices had *appointment assistance*, 4 practices had *home health management*, 7 practices had *patient education and self-management*, 6 practices had *medication management*, 4 practices had *empanelment*, 6 practices had *team huddles*, 5 practices had *written care plans*, 6 practices had *pre-visit planning*, 6 practices had *care management for high-risk patients*, 5 practices had *transitional care management*, 7 practices had *other care management*, and 4 practices had expanded services into *behavioral health*. Participating practices varied in contextual characteristics as well: 4 practices were located in a CPC+ region; 3 practices participated in CPC+; 2, 2, 1, 2, and 2 practices were in the Mountain, New England, Middle Atlantic, South Atlantic, and Pacific Census divisions, respectively; and 7 practices were in urban areas (with 2 practices in rural areas). One practice had 1 physician, 2 practices had 2 or 3 physicians, 5 practices had 4 to 9 physicians, and 1 practice had 10 or more physicians. Five practices had some sort of hospital affiliation.

Participant Selection

We interviewed between one and seven participants per practice and conducted a total of 32 interviews. The variation in the number of participants per practice was primarily due to the number of roles engaged in CPC capabilities within the practice. A practice where fewer roles engaged in such activities had fewer interviews, for example, because we requested an interview with only one individual from each role or job title. Likewise, a practice with more roles of interest would have more interviews.

Participants were selected by the practice leader who completed the cost-reporting workbook. To inform the practice leader's selection, we provided the leader with a list of the roles or job titles at that practice identified in the cost-reporting workbook as being involved in capabilities of interest. We then asked the practice leader to identify one person in each of those roles whom we could invite to interview and recruited the identified individuals via a personal email invitation, following up by email and telephone as needed. Once the individual agreed to participate, we scheduled the interview. We invited 39 people for interviews; one declined, one canceled, and five did not respond to multiple contact attempts. In total, 32 participant interviews were conducted.

While we engaged with the practice leader in generating the cost-reporting workbooks, in conducting frontline personnel interviews, we engaged with a range of personnel who were involved in delivering CPC capabilities at the practice. Such personnel included clinicians, behavioral health providers, care managers, MAs, pharmacists, office and practice leaders, and front-office staff. We also engaged the practice leader (previously interviewed in the practice-leader interview) in the frontline personnel interview, if he or she was directly involved in one or more of the capabilities of interest.

Instrument Development: Frontline Personnel Interviews

To validate the data collected in the cost-reporting workbook, to glean additional nuances related to the capabilities of interest, and to explore capability implementation pathways, we conducted semi-structured interviews with frontline personnel to probe participants' experiences with these areas.

The interviews contained two major sections: (1) a review of the participant's involvement in capabilities relevant to the frontline personnel interviews and (2) a discussion of the implementation of those capabilities over time. The first section was the focus of the validation analysis (confirming or disconfirming the data previously gathered) (Andersen et al., 2012). The second section was the focus of the thematic analysis.

Once a protocol of the frontline personnel interview was drafted, it was presented to the CMS COR and the project TEP for review and comment. After we implemented their revisions, we performed cognitive testing with the first practice recruited for the frontline personnel interviews. The interviewer conducted one-on-one interviews with participants from that practice and then reserved an extra 15-minute block at the end of the interview to discuss what aspects of the protocol could be improved. Specifically, we asked participants to reflect on their interview experience and to share their thoughts regarding areas that may need to be clearer (e.g., whether there was a way to be more succinct, whether there were probes or examples missing that would make the questions clearer). The protocol developed for the frontline personnel interview is provided in the Appendix.

Before conducting each interview, the interviewer reviewed the cost-reporting workbook for the practice to create a protocol that was tailored to the role played by the participant. The interviewer used the workbook data to tailor the protocol in the following ways:

- To order questions such that the interviewer first asked about the capabilities in which the interviewee participated (according to the workbook), then asked about the capabilities at the practice that were not done by the participant (according to the workbook), and finally asked about the capabilities that the cost-reporting workbook did not report as being provided by the practice.
- To estimate the hours per week that the participant spent toward each capability (according to the cost-reporting workbook). We obtained this number by dividing the total hours spent on the capability per week (which the practice leader reported to be performed by individuals in that role) by the count of people in that role. This number was not shared with the participant; we used it to know to probe further when a mismatch was observed (e.g., if the participant reported not being involved in a capability, we could know to ask whether there was a recent shift in duties).
- To get a sense of what the capability entailed in each practice (as reported by the practice leader).

Data Collection: Frontline Personnel Interviews

Interviews were conducted over the phone by one of two interviewers. They were one-on-one[2] and semi-structured. Each interview lasted between 30 and 45 minutes.

The researcher conducting the interview prepared by reviewing the protocol as well as the practice's cost-survey responses. After the interview, the researcher performed reflective journaling, recording thoughts about such items as the interaction, any questions that arose, items to follow up on in later interviews with the practice, possible new probes identified, and any overarching themes that emerged. Regular team meetings also offered researchers the opportunity to debrief on the interviews.

Before the interview, participants were emailed an informational sheet describing the study, which included consent information. Then prior to beginning the interview, participants provided their verbal consent. Interviews were audio-recorded with permission and transcribed for thematic analysis.

The task leader conducted the first few frontline interviews and debriefed the team periodically. Then a second interviewer was prepared to conduct interviews by reviewing the protocol and listening to audio files of interviews done by the task leader, followed by debriefings with the task

[2] This is with the exception of one interview, where the practice manager insisted on being in the room with the MA during the interview. In that case, both participants contributed answers to interview questions.

leader and the qualitative team. The task leader then listened to the first few interviews conducted by the second interviewer and went through debriefing to ensure consistency.

In qualitative team meetings, we discussed frontline interview participants' experiences with the interview questions and, when needed, identified additional language needed to help future participants during the interview. Finally, a subset of later interviews was periodically reviewed and discussed by the interviewers to ensure consistent application of the interview protocols.

Data Analysis: Frontline Personnel Interviews

Our analysis of the interview data consisted of validation testing as well as thematic coding and analysis of the range of themes.

Validation Testing

We compared practice leader and frontline estimates by creating formulas in Microsoft Excel that compared table values of the information provided in the cost-reporting workbooks (by practice leaders) with table values of the information reported in frontline personnel interviews. The comparisons explored two aspects:

- Whether the frontline participant engages in the capability.
- The hours per week that the participant spends on the capability.

The information from practice leaders used for this comparison had already been captured in order to prepare the frontline-personnel-interview protocol (described above). To capture the validation information from frontline interviews, we reviewed transcripts and/or audio files of the interviews and recorded these same two pieces of information for each capability of interest. We added notes in a separate field whenever additional context was shared that would help in understanding the participant's response.

Validation results include counts of confirmation (and disconfirmation) between practice-leader and frontline-participant reports as well as counts for the amount of discrepancy: estimates that are off within a half-day, between a half-day and day, and more than one day per week. We also calculated percentages for each category of interest (e.g., appointment assistance). Then we identified the minimum, maximum, median, and average values across categories. We also noted reasons given for the discrepancies observed. We report these findings in Chapter Four as well as in the Appendix.

Thematic Coding and Analysis

A third-party vendor securely transcribed interview recordings. Then we analyzed the transcripts using NVivo qualitative data analysis software (QSR, 2012) and Microsoft Word. We developed the codebook for qualitative analysis in a two-stage consensus-based coding process. The first stage consisted of developing an initial codebook that incorporated the topics of the interview protocol and emergent themes that were identified by reviewing three transcripts. We

reviewed this codebook, and it became the team's initial codebook. One team member then applied it to two transcripts, and we made additional revisions. Then three team members coded a third transcript and conducted debriefing. Once we reached consensus, these three team members proceeded to code the interviews. Each team member was then assigned a subset of capabilities and asked to summarize the range of themes observed within each capability. We report these findings in Chapter Five as well as in the Appendix.

Limitations

Our methods for describing and estimating the costs of comprehensive primary care capabilities have limitations. The practice sample was not designed to be nationally representative, and results might be inapplicable to practices with characteristics substantially different from those in our sample (e.g., serving substantially different patient populations). Participation in the data collection was voluntary, and practices that participated might have differed from practices that did not. The practice-reported comprehensive primary care capabilities were described by practice leaders only, were not validated by methods such as time-and-motion study, and might differ with the perspectives of the frontline staff who deliver them. The labor hours and other costs of these capabilities reported by practice leaders might have been over- or underestimated. Practices did not have internal accounting systems that tracked expenses for individual capabilities, so no "gold standard" estimates of these costs existed. Therefore, we could not calculate the degree of measurements' accuracy or precision—even though practice leaders approved them as having face validity. In some cases, neither practices nor their parent organizations could estimate the expenses incurred by parent organizations in supporting the capabilities of a particular practice. Such expenses were especially difficult to apportion for organization-wide capabilities such as EHRs, which frequently supported subspecialty practices and hospitals as well as primary care practices and supported functionalities that were not comprehensive primary care capabilities. We also lacked data on the quality of services provided.

Validation testing also had limitations. First, the sample was small. Its purpose was to explore the limitations of the workbook results due to possible variations in the reports of participants and leaders. Second, our participant selection relied on the input of practice leaders. When a practice had more than one staff member in a given category, the practice leader had to choose one person to represent that staff category's experience. It is possible that practice leaders chose individuals with nonrepresentative experiences for participation. Also, there were times when the practice leader did not provide a potential participant for one or more of the roles of interest, limiting our ability to assess overall validity across participants and capabilities. Third, some practices and some participants may have been less willing to participate, causing a systematic exclusion of their experience. This primarily came up among practices affiliated with parent organizations, where practice leaders were unsure whether employees could be compensated for their time in the interview.

3. Findings on Data-Collection Methods

This project sought to develop a new method for collecting descriptions of practices' comprehensive primary care capabilities and estimating their costs. In this chapter, we present our findings regarding the performance of these new data-collection methods. These findings include response data, observations on maintaining practice engagement throughout a multi-stage data-collection exercise, and changes to the recruitment and data-collection protocols.

Response Rate

As described in Chapter Two, our sample included practices that had and had not applied to CPC+. To create the sample frame of eligible practices that had not applied to CPC+ (which was necessary because there was no preexisting national database with information on our eligibility criteria), we conducted a screener survey. The response rate for the screener survey was 62.9 percent (202 responses out of the 321 practices that were sent a screener survey).

Drawing from the combined sample frame of CPC+ applicants and non-CPC+ applicants that met our eligibility criteria, we invited a total of 125 practices (including the four pilot practices) to participate in the semi-structured interviews and cost-data collection. Two of these practices were ineligible because they had closed. Of the remaining 123 practices, 52 agreed to participate. Two practices that completed the semi-structured interview withdrew from the study after reviewing their cost-reporting workbooks, yielding a final sample of 50 practices (for a response rate of 41 percent).

As shown in Table 4, the composition of the final sample closely approximated the target sample. Response rates varied by sampling dimension. Most notably, the response rate was higher among CPC+ participants (49 percent) than among non-CPC+ participants (36 percent); it was also higher among practices not affiliated with a parent organization (46 percent) than among those that were affiliated (35 percent). While participation in this study was not a condition of CPC+ participation, the higher response rate among these practices might be explained by their general tendency to volunteer for CMS projects. Practices affiliated with parent organizations required approval and participation from parent organization staff. This additional participation requirement explains their lower response rate, since several such practices wanted to participate but were prevented from doing so by their parent organizations (e.g., because the parent organization had competing priorities or did not believe cost estimation would be possible).

Table 4. Sample Obtained

Sampling Dimension	Value	Target Number of Practices	Number of Practices Invited	Number of Practices Recruited	Response Rate
CPC+ participation status	Practices participating in CPC+	20	45	22	49%
CPC+ participation status	Practices located in CPC+ regions that applied but that *were ineligible* to participate in CPC+ for reasons other than our survey eligibility criteria	5	15	5	33%
CPC+ participation status	Practices located in CPC+ regions that *were eligible* to participate in CPC+ based on our eligibility criteria *but did not apply*	5	11	4	36%
CPC+ participation status	Practices located outside CPC+ regions that would have otherwise been eligible for CPC+ based on our eligibility criteria	20	52	19	37%
Census division	New England	4	10	4	40%
Census division	Middle Atlantic	8	19	8	42%
Census division	East North Central	9	15	8	53%
Census division	West North Central	3	8	3	38%
Census division	South Atlantic	9	23	8	35%
Census division	East South Central	4	14	4	29%
Census division	West South Central	5	12	6	50%
Census division	Mountain	3	7	4	57%
Census division	Pacific	5	15	5	33%
Urban or rural status	Urban	40	95	39	41%
Urban or rural status	Rural	10	28	11	39%
Practice size	1 PCP	12	28	11	39%
Practice size	2–3 PCPs	13	38	13	34%
Practice size	4–9 PCPs	13	34	13	38%
Practice size	10 or more PCPs	12	23	13	57%
Affiliation with parent organization	Affiliated	25	66	24	35%
Affiliation with parent organization	Not affiliated	25	57	26	46%

NOTE: The target numbers of practices also appear in Table 3 and are redisplayed here for convenience.

Duration of Data Collection

The duration of data collection, which is important to future researchers considering the methods we piloted, was longer than anticipated and ranged widely across practices. Among the practices that completed both the semi-structured interview and the cost workbook, the median

interval between interview completion and workbook completion was 58 days (with a range of 21 to 210 days). Among practices that completed all stages of data collection, the median interval between interview completion and practice signoff of the cost summary was 96 days (with a range of 40 to 232 days). The median interval between cost-workbook completion and practice signoff of the cost summary was 24 days (with a range of 3 to 72 days).

Data collection tended to proceed more quickly for practices that were not affiliated with a parent organization (with a median of 75 days between semi-structured interview and practice signoff) than for practices that were affiliated (median, 105 days). Contributors to this difference in duration included delays in scheduling telephone calls (since calls with affiliated practices tended to involve parties from both the practice and parent organization) and the relatively greater organizational complexity of affiliated practices (resulting in more time spent gathering cost data from multiple parts of their organizations).

Maintaining Practice Engagement

Maintaining practice engagement in the study was challenging, despite a financial incentive of $3,750 for study completion. Because data collection required at least three telephone calls, unanticipated events between these calls (e.g., local natural disasters, deaths of practice leaders' relatives) sometimes required practices to disengage from study activities for extended periods. Re-engaging these practices required substantial outreach in some cases.

Many practices required reassurance regarding their ability to provide data, especially after they reviewed the cost-reporting workbook, a task that some described as daunting. Multiple practice leaders described feeling overburdened in general, with many competing demands on their time (including, but not limited to, CPC+ program requirements). In many practices, staff members were not comfortable using Excel without assistance from study investigators. Several practices also benefited from reassurance that an inability to estimate the costs of some comprehensive primary care capabilities did not disqualify them from providing data on other capabilities.

No participating practice reported having previously examined its expenses for comprehensive primary care capabilities in the degree of detail elicited by the cost-reporting workbook. Upon completion of the study, several practice leaders remarked that it was an eye-opening exercise, generating new insights into practice financial sustainability. Some reported planning to make changes to their practices (e.g., change staffing levels, scale-up or discontinue some comprehensive primary care capabilities) based on the cost summaries they received.

Changes to Recruitment and Data-Collection Protocols

About halfway through the fielding period, we changed our recruiting strategy due to the data collection of each participating practice taking longer than anticipated. Our original sampling strategy, designed to maximize our response rate, invited only one practice per sample-frame cell

(i.e., per combination of desired sampling dimensions) at a time, drawing replacement practices into the sample only when an invited practice declined to participate. The main drawback of this approach was that it slowed recruiting. To accelerate recruitment, we switched to inviting two to three practices per sample-frame cell (even though we desired only one practice per cell), and placed same-cell practices on hold when the first one consented to participate. This switch helped recruit 50 practices within the project timeline but reduced the response rate.

Early in the fielding period, after experiences in which staff members at one pilot practice were uncomfortable with Excel (and overwhelmed by the prospect of completing the cost-reporting workbook on their own), we made a fundamental change to how practices completed the cost-reporting workbook. Instead of asking practices to complete the workbook on their own and offering to help only if needed, we asked practices to complete the workbook via telephone, with RAND study staff entering all data into the workbook. This approach allowed practice staff to peruse the workbook to understand what data would be required, without needing to convert units familiar to the practice (e.g., labor hours per month, the percentage of a given staff member's time in the practice) into the units requested by the workbook (e.g., hours per week). This approach also allowed study staff to quickly clarify any unclear data requests or practice answers.

Accuracy of BLS Wage and Salary Data

For eight practices, we imputed some or all of the wage and salary data for practice staff, because practice leaders were unable to share these data. Whenever we used BLS data, we asked practice leaders to confirm that the data were in the right ballpark during the final stage of data collection (i.e., the practice leader's review of the cost summaries). With only one exception, practice leaders confirmed that BLS data were reasonable approximations of the wages and salaries paid within their practices. In the one practice in which BLS wage and salary data deviated substantially from wages and salaries actually paid, practice leaders provided the correct wage and salary data.

4. Findings: Costs of Comprehensive Primary Care Capabilities

This chapter presents selected findings on the distribution and costs of comprehensive primary care capabilities among the 50 practices that completed data collection. These findings include the characteristics of the 50 practices; the overall frequency of each standardized capability; the overall costs of the capabilities (summing across capabilities within a practice); summary cost data for each of these capabilities; and detailed capability descriptions, cost data, and validation data (from the frontline personnel interviews) for four select standardized capabilities. Detailed data on annual costs for the remaining standardized capabilities are available in the Appendix.

As noted in Chapter Two, our primary denominator for displaying cost data was the number of FTE PCPs in a practice. We chose this denominator rather than the number of patients on a practice's panel because practice leaders used widely divergent methods of estimating panel sizes (e.g., number of patients listed in the practice's EHR as being empaneled to a practice PCP; number of patients seen in a given year, regardless of whether they were truly considered to be on the practice's panel), and many reported high levels of uncertainty regarding their panel-size estimates. In contrast, practices reported little to no uncertainty concerning their numbers of FTE PCPs. However, despite their imprecision, we present the per-patient results in the detailed descriptions of the cost findings for each capability.

Medication management had the highest annual median cost per FTE PCP ($11,496 per year), and extended hours had the lowest ($0) because the majority of practices offering extended hours did so without incurring net marginal costs (i.e., no overtime and no unfilled appointment slots).

Both within and between standardized capabilities, we found a wide range of costs per FTE PCP. In general, the observed cost variation within a given standardized capability (e.g., between the multiple practice-reported capabilities that were categorized as being "medication management") could be at least partially explained by substantial differences in the services provided. In other words, variability in the costs of a standardized capability seemed, in many cases, to stem from practices providing fundamentally different levels of service to their patients. In other cases, however, high-cost outlier practices appeared to offer the same service at a higher price (e.g., because they used more-expensive labor mixes).

Across the standardized capabilities, annual costs substantially exceeded startup costs. However, many practices had difficulty estimating startup costs, especially when these costs were incurred more than one or two years before we collected data.

When available, we present validation results (frontline personnel's confirmation and disconfirmation of labor estimates made by practice leaders). For capabilities that have detailed descriptions in this chapter, the validation results are presented alongside the detailed data.

Validation results for other capabilities are available in the Appendix. An overall summary of validation results is provided toward the end of this chapter.

At the end of the chapter, we report findings on the marginal cost of an office visit.

Practice Characteristics

Table 5 displays the characteristics of the 50 practices that completed data collection. These practice characteristics were generally distributed as desired across the sampling dimensions, although relatively few practices affiliated with parent organizations had completed data collection (consistent with longer data-collection periods for such practices).

Table 5. Characteristics of Practices That Completed Data Collection

Characteristic	Value	Number of Practices	Percentage of Target Count*
CPC+ participation status	Practices participating in CPC+	22	110%
CPC+ participation status	Practices located in CPC+ regions that applied but that *were ineligible* to participate in CPC+ for reasons other than our survey eligibility criteria	5	100%
CPC+ participation status	Practices located in CPC+ regions that *were eligible* to participate in CPC+ based on our eligibility criteria *but did not apply*	4	80%
CPC+ participation status	Practices located outside of CPC+ regions that would have otherwise been eligible for CPC+ based on our eligibility criteria	19	95%
Census division	New England	4	100%
Census division	Middle Atlantic	8	100%
Census division	East North Central	8	89%
Census division	West North Central	3	100%
Census division	South Atlantic	8	89%
Census division	East South Central	4	100%
Census division	West South Central	6	120%
Census division	Mountain	4	133%
Census division	Pacific	5	100%
Urban or rural status	Urban	39	98%
Urban or rural status	Rural	11	110%
Practice size	1 PCP	11	92%
Practice size	2–3 PCPs	13	100%
Practice size	4–9 PCPs	13	100%
Practice size	10 or more PCPs	13	109%

Table 5—Continued

Characteristic	Value	Number of Practices	Percentage of Target Count*
Affiliation with parent organization	Affiliated	24	96%
Affiliation with parent organization	Not affiliated	26	104%
Data imputation	Required imputed salary data	8	N/A
Data imputation	Did not require imputed salary data	42	N/A

*The target count of practices in each category is listed in Table 3.

Table 6 displays the characteristics of the patient panels of the 50 practices that completed data collection. These patient characteristics were reported by practice leaders and have not been validated against any other data source.

Table 6. Patient-Panel Characteristics of Practices That Completed Data Collection

Characteristic	Median	Range
Race: Alaska Native or Native American	0%	0–10%
Race: Asian	2%	0–40%
Race: Black or African American	5%	0–72%
Race: Native Hawaiian or other Pacific Islander	0%	0–75%
Race: White	76%	0–99%
Race: Other	1%	0–80%
Race: Unknown	0%	0–24%
Ethnicity: Hispanic	5%	0–95%
Preferred language: English	96%	5–100%
Payer mix: % Commercial or private	50%	2–94%
Payer mix: % Medicare	27%	5–63%
Payer mix: % Medicaid	11%	0–65%
Payer mix: % Uninsured	2%	0–59%
Payer mix: % Other pay	0%	0–30%

The patient-panel sizes reported by practice leaders ranged from 600 to 41,550 patients per practice and from 500 to 4,363 patients per FTE PCP. Much of this variability might have been due to practice leaders' use of different definitions of "patient panel" and their uncertainty concerning panel size estimates in many cases.

Distribution of Standardized Comprehensive Primary Care Capabilities

Table 7 displays the frequencies and cluster memberships of the standardized capabilities used by the 50 practices that completed data collection. The most common capability was empanelment (92 percent of practices), and the least common capability (excluding the catch-all categories such as "other enhanced access") was shared decisionmaking (16 percent of practices).

Table 7. Frequencies of Standardized Comprehensive Primary Care Capabilities

Standardized Capability Group	Standardized Capability	Number of Practices with Capability	Percentage of Practices with Capability	Capability Cluster
Care management	Appointment assistance	41	82%	1
Care management	Home health management	25	50%	1
Care management	Patient education and self-management support	44	88%	1
Care management	Medication management	42	84%	1
Care management	Team huddles	31	62%	1
Care management	Written care plans	28	56%	1
Care management	Previsit planning	32	64%	1
Care management	Care management for high-risk patients	35	70%	1
Care management	Transitional care management	36	72%	1
Care management	Other care management	29	58%	1
Empanelment*	Empanelment	36	92%	1
Care coordination infrastructure	Service agreements	21	42%	2
Care coordination infrastructure	Community service lists	38	76%	1
Care coordination infrastructure	Software-based communication infrastructure	43	86%	1
Care coordination infrastructure	Other communication infrastructure	39	78%	1
Care coordination infrastructure	Other care coordination infrastructure	6	12%	2
Comprehensiveness	Geriatric care	3	6%	2
Comprehensiveness	Behavioral health	20	40%	2
Comprehensiveness	Other expanded services	42	84%	1
Continuity	Home visits	23	46%	2
Continuity	Hospital visits	16	32%	2
Continuity	Other external visits	16	28%	2
Continuity	On-call system	37	74%	1

Table 7—Continued

Standardized Capability Group	Standardized Capability	Number of Practices with Capability	Percentage of Practices with Capability	Capability Cluster
Enhanced access	Same-day or next-day office visits	45	90%	1
Enhanced access	Extended hours	32	64%	1
Enhanced access	Patient care other than office visits	37	74%	1
Enhanced access	Other enhanced access	0	0%	N/A
Planned care and population health	High-risk patient list	31	62%	1
Planned care and population health	Preventive or overdue care list	41	82%	1
Planned care and population health	Performance measurement	32	64%	1
Planned care and population health	Performance improvement	42	84%	1
Planned care and population health	Other planned care and population health	7	14%	2
Patient and caregiver engagement	Shared decisionmaking	8	16%	2
Patient and caregiver engagement	Patient surveys	31	62%	1
Patient and caregiver engagement	PFAC	24	48%	2
Patient and caregiver engagement	Other patient and caregiver engagement	0	0%	N/A

*Excludes 11 solo practices, which are trivially empaneled.

The nonhierarchical cluster model identified two clusters of standardized capabilities, dividing by frequency of adoption. Twenty-four standardized capabilities were in cluster 1, while 10 were in cluster 2. Cluster 1 capabilities were concentrated in care management, empanelment, care-coordination infrastructure, enhanced access, planned care, and population health. Cluster 2 capabilities were concentrated in the continuity and patient and caregiver engagement groups. Within the comprehensiveness capability group, geriatric care and behavioral health were in cluster 2, while other expanded services were in cluster 1. Cluster 2 capabilities were adopted less frequently (6 percent to 48 percent of practices) than cluster 1 capabilities (50 percent to 92 percent of practices).

The nonhierarchical cluster model also identified two clusters of practices based on their patterns of capability adoption. Cluster 1 practices tended to adopt most or all of the cluster 1 capabilities and few or none of the cluster 2 capabilities. Cluster 2 practices adopted fewer capabilities overall, but distributed them more evenly between both capability clusters.

Importantly, the cluster analysis did not indicate that practices' adoption of capabilities was hierarchical (e.g., with capability A being a precondition for capabilities B or C). This means that adoption of cluster 2 capabilities was not contingent upon adoption of cluster 1 capabilities.

As shown in Table 8, there were 33 practices in cluster 1 and 17 practices in cluster 2. Cluster 1 practices were almost evenly split between CPC+ participants and non-participants, while three-fourths of cluster 2 practices were CPC+ non-participants. This asymmetry within the sample might be explained, in part, by the evolving design of CPC+, which incentivized participants to adopt cluster 1 capabilities initially and then added incentives for cluster 2 capabilities (e.g., continuity and comprehensiveness, for CPC+ Track 2 practices) in 2017.

Urban versus rural location was more symmetrically distributed between cluster 1 and cluster 2 practices. Compared to cluster 1 practices, cluster 2 practices were more likely to be solo practices and to not be affiliated with a parent organization.

Table 8. Characteristics of Practices in Each Practice Cluster

Practice Characteristic	Number of Practices in Cluster 1	Percentage of Practices in Cluster 1	Number of Practices in Cluster 2	Percentage of Practices in Cluster 2
All practices	33	100%	17	100%
Practices participating in CPC+	18	55%	4	24%
Practices not participating in CPC+	15	45%	13	76%
Urban practices	26	79%	13	76%
Rural practices	7	21%	4	24%
Practices with 1 PCP	4	12%	7	41%
Practices with 2–3 PCPs	11	33%	2	12%
Practices with 4–9 PCPs	8	24%	5	29%
Practices with 10 or more PCPs	10	30%	3	18%
Practices affiliated with a parent organization	20	61%	4	24%
Practices not affiliated with a parent organization	13	39%	13	76%

Overall Costs of Comprehensive Primary Care Capabilities

Table 9 gives a summary of the overall annual costs of comprehensive primary care capabilities per FTE PCP, summing across all reported capabilities within each of the 50 practices that completed data collection. Labor costs were substantially higher than nonlabor costs across all practice categories.

Table 9. Overall Marginal Costs of Comprehensive Primary Care Capabilities per FTE PCP per Year

Practice Characteristic	Median Total Costs per FTE PCP ($)	Total Cost Range per FTE PCP ($)	Median Labor Costs per FTE PCP	Median Non-Labor Costs per FTE PCP
All practices	113,171	10,561–275,500	103,509	3,235
Practices participating in CPC+	106,344	32,373–275,500	103,509	3,957
Practices not participating in CPC+	118,966	10,561–183,801	104,689	2,601
Urban practices	117,586	10,561–275,500	105,886	2,601
Rural practices	106,584	40,554–204,123	101,132	5,963
Practices with 1 PCP	143,843	46,323–275,500	116,313	5,452
Practices with 2–3 PCPs	106,105	38,111–199,687	99,965	4,283
Practices with 4–9 PCPs	120,346	58,477–204,123	110,878	2,601
Practices with 10 or more PCPs	89,585	10,561–183,801	89,215	2,365
Practices affiliated with a parent organization	111,845	10,561–199,687	102,926	2,674
Practices not affiliated with a parent organization	114,551	38,111–275,500	106,005	3,808
Practices in cluster 1	106,584	32,373–204,123	101,132	4,283
Practices in cluster 2	122,752	10,562–275,500	110,878	2,143

NOTE: The costs in this table are the marginal costs of offering comprehensive primary care capabilities; they are not the total costs of running a primary practice (i.e., the full costs of running a primary care practice, including services that are not comprehensive primary care capabilities). Median total costs, labor costs, and nonlabor costs were determined independently, so the median total cost need not equal the sum of the median labor cost and median nonlabor cost in each row.

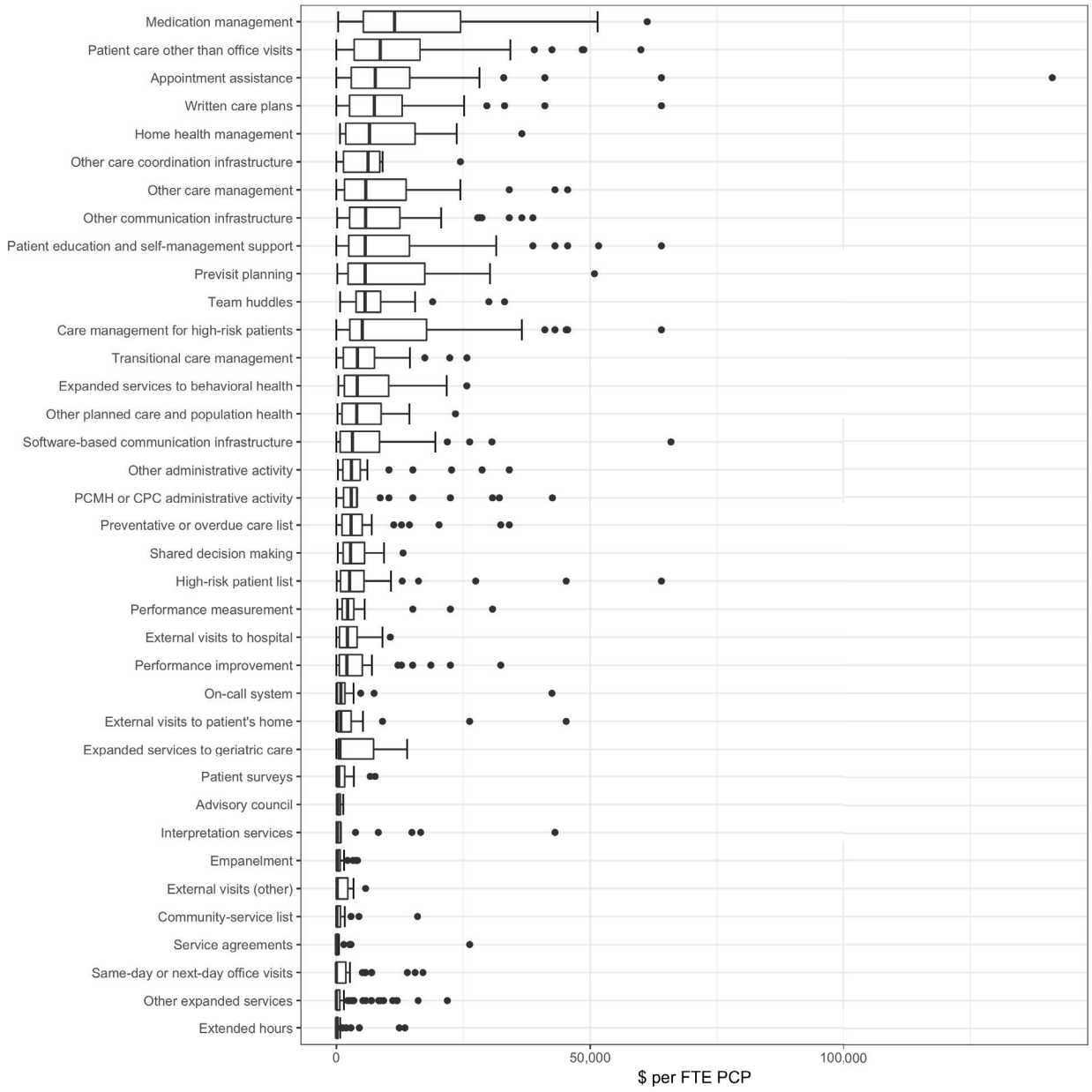
The median estimated annual cost ($113,171) of comprehensive primary care capabilities per FTE PCP in our sample was similar to the cost estimate published by Magill et al. ($104,799 per PCP), who used semi-structured interviews to estimate the costs that 16 practices in Utah and Colorado incurred when delivering all capabilities related to comprehensive primary care (Magill et al., 2015); however, it was higher than the cost estimate ($64,768 per PCP) published by Martsolf et al. using similar methods among 13 Pennsylvania practices (Martsolf et al., 2016). Differences in methodology, capabilities assessed, and timeframe could underlie differences between the cost estimates presented here and those published previously. Small sample sizes among the comparison studies (just 16 and 13 practices, respectively) could also explain these differences. Estimates based on small sample sizes are likely to be highly unreliable, so random variation alone could account for these substantial differences.

Overall, the reported startup costs per FTE PCP, summing across all capabilities within each practice (a median of $2,276 per FTE PCP; a range of $0/unknown to $93,552), were much lower than annual costs. However, practice leaders expressed great uncertainty regarding their startup cost estimates for many capabilities. Because the majority of startup capability costs were reported as unknown, we omitted them from this report.

Summary Data on Costs of Comprehensive Primary Care Capabilities

Figure 1 displays the medians, interquartile ranges (IQRs), and ranges of total annual costs per FTE PCP for all 34 standardized capabilities reported by one or more practices. It also shows

Figure 1. Costs of Comprehensive Primary Care Capabilities



NOTE: The lower and upper hinges correspond to the first and third quartiles (the twenty-fifth and seventy-fifth percentiles). The upper whisker extends from the hinge to the largest value, no further than 1.5 * IQR from the hinge (where IQR is the interquartile range, or the distance between the first and third quartiles). The lower whisker extends from the hinge to the smallest value, at most 1.5 * IQR of the hinge. Data points beyond the ends of the whiskers are plotted individually. The costs in this table are the marginal costs of each comprehensive primary care capability; they are not the total costs of running a primary practice (i.e., the full costs of running a primary care practice, including services that are not comprehensive primary care capabilities).

the three additional comprehensive primary care-related cost categories listed at the bottom of Table 2: interpretation services, PCMH or CPC-related administrative activities, and other administrative activities.

Medication management had the highest median annual cost per FTE PCP, and extended hours had the lowest. The costs for most capabilities exhibited high variability, though there were exceptions (e.g., advisory council).

Detailed Descriptions of Selected Comprehensive Primary Care Capabilities and Their Costs

Here, we report detailed cost and capability findings for the following standardized comprehensive primary care capabilities: medication management, behavioral health, high-risk patient lists, and a patient and family advisory council (PFAC). We selected these capabilities to present a sample that ranged in prevalence and cost. Cost findings for the remaining standardized capabilities are available in the Appendix.

We also present the results of comparing practice leader estimates to frontline personnel estimates for time spent engaging in medication management and behavioral health (as these were also captured in frontline interviews). Validation results for the other capabilities captured in frontline personnel interviews are reported in the Appendix.

Medication Management

As a standardized capability, we defined medication management as follows: "Practice performs medication management, which might include reviewing and reconciling medications (including over-the-counter medications and supplements), providing information about new medications, assessing patient/family understanding of medications, assessing patient response to medications, and addressing barriers to adherence."

As shown in Figure 2 and Table 10, the median annual cost per FTE PCP for medication management was $11,496 with a wide range ($357 to $61,250), owing to a small number of low and high outliers. Eleven of the 42 practices providing medication management relied at least partially on clinical pharmacist labor. The highest-cost instance of medication management used an expensive labor mix: exclusively physician labor.

As shown in Figure 3, many practice-reported capabilities that mapped to medication management also included elements of other standardized capabilities. However, this coupling across standardized capabilities did not explain the variability in costs per FTE PCP. Within our sample, the largest practices tended to have lower costs per FTE PCP, though there were also smaller practices at both ends of the cost distribution.

Figure 2. Annual Costs of Medication Management per FTE PCP

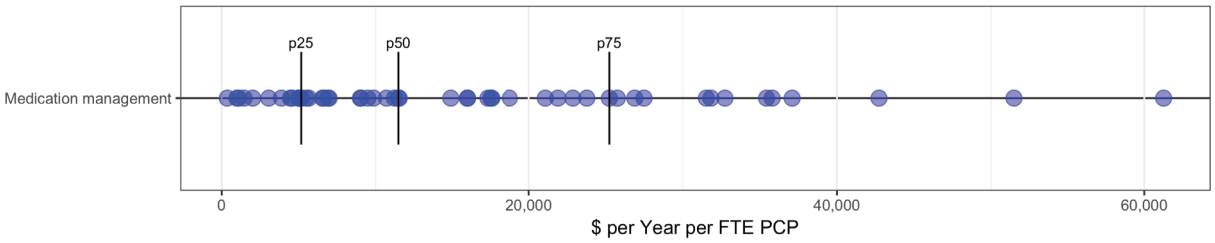
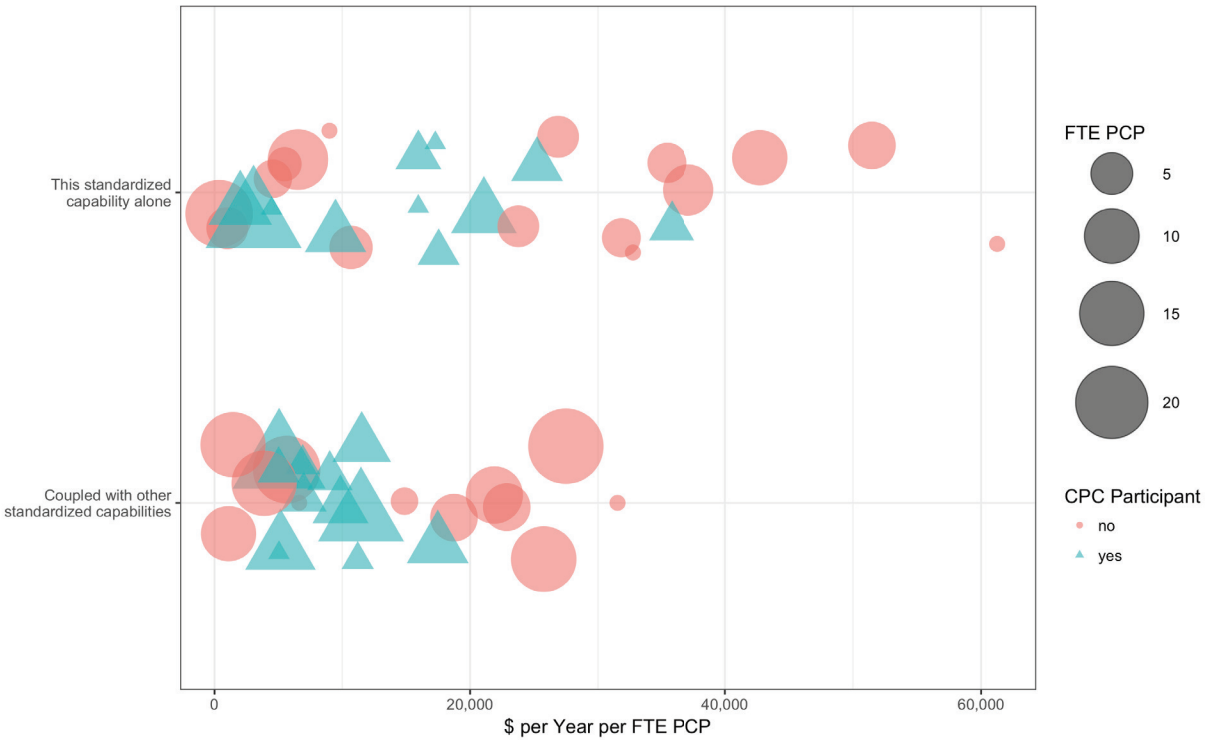


Table 10. Quantiles of Annual Costs of Medication Management per FTE PCP and per Patient

Cost Estimate	$ per Year per FTE PCP*	$ per Year per Patient	Practice-Reported Capability
Minimum	357	0.24	The practice may perform medication management, including reviewing and reconciling medications.
P25	5,158	4.21	A pharmacist based in the clinic provides medication education and safety; management of drug interactions; compliance and cost information; longitudinal management of chronic conditions such as asthma, diabetes, hyperlipidemia, and hypertension; and help with transitional-care visits.*
P50	11,469	N/A	Care managers conduct medication reconciliation during transitions-of-care for patients with chronic conditions, and during acute visits. MAs assist patients who call in for renewals, refill certain medications, or send the medication request to the provider. The pharmacist reviews patient lists at the system level and handles medication interactions, acts as a resource for providers, and monitors patient medications.*
P75	25,232	17.36	Nurses review medication lists with patients at the beginning of all non-acute-care and transitional-care appointments. Providers then spend time reviewing the lists from nurses and adjusting medications as necessary.
Maximum	61,250	30.62	The physician performs medication management, which includes reviewing and reconciling medications at every visit. The physician also asks patients to bring their medications with them to appointments.

NOTE: Fifty-one practice-reported capabilities from 42 practices were used to populate this table. Of these, zero capabilities had unknown costs. In comparisons among practices, costs per patient were not proportional to costs per FTE PCP because patient-panel sizes per FTE PCP varied widely. N/A (not applicable) per-patient costs are present when a practice could not estimate its patient-panel size.
*This practice-reported capability spans multiple standardized capabilities (i.e., the standardized capability is coupled with other standardized capabilities, and the cost estimates therefore include multiple capabilities).

Figure 3. Annual Costs of Medication Management per FTE PCP, with Practice Characteristics



NOTE: In this figure, the triangles represent capabilities of practices participating in CPC+, and the circles represent capabilities of practices not participating in CPC+. The size of each circle and triangle is proportional to the number of FTE PCPs in the practice.

Frontline Personnel Confirmation and Disconfirmation of Practice Leader Estimates

Among the 32 participants who commented on whether they provided medication management services, 15 participants agreed with practice leaders that they didn't have a role in the capability.

Eight agreed that they did have a role in the capability but disagreed on the quantity. For three participants, their leader's estimate of time spend in this capability was off by within a half-day per week. For three participants, their leader's estimate of time spent in this activity was off by more than a half-day and less than a day per week. For two participants, their leader's estimate of time spent in this activity was off by more than a day per week.

One participant agreed that he/she had a role in the capability but did not confirm or disconfirm the practice leader's estimate as he/she was unable to provide an estimate.

Eight participants disagreed with leaders on whether they had a role in the capability at all. One participant was incorrectly reported by the practice leader as performing this activity (he/she does not perform this activity). Seven participated in this activity, although the leader did not report this. Of these seven participants, six reported spending up to one half day per week and one participant reported spending more than one day per week when the leader had not reported hours for them that contributed to medication management.

Behavioral Health

As a standardized capability, we defined behavioral health as "Practice provides enhanced or dedicated behavioral health services."

As shown in Figure 4 and Table 11, the median annual cost per FTE PCP for behavioral health was $3,723 with a wide range ($405 to $25,731), owing to a small number of high outliers. The highest-cost practice-reported behavioral health capability used parent organization staff who did not bill for their services (thus producing no offsetting revenue). The lowest-cost capability represented relatively minimal behavioral health services.

Figure 4. Annual Costs of Behavioral Health per FTE PCP

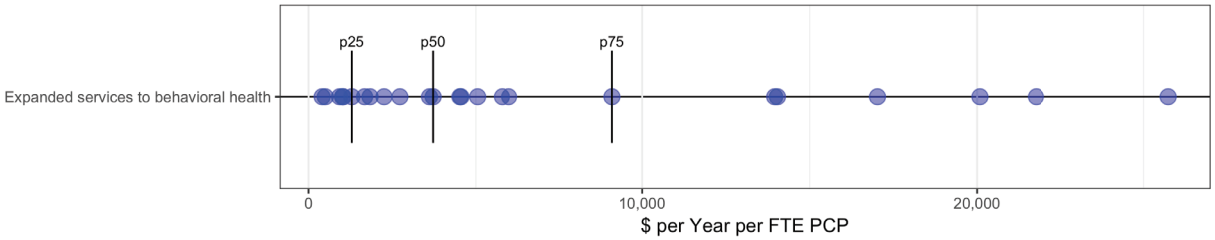


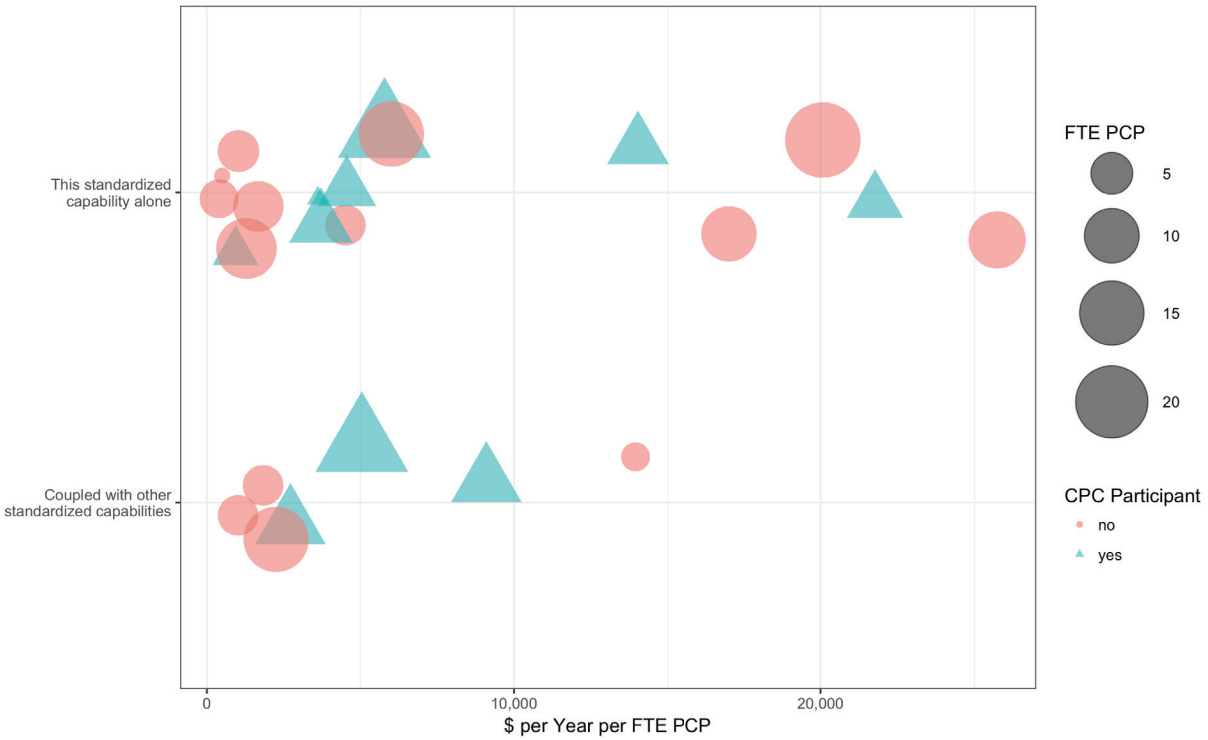
Table 11. Quantiles of Annual Costs of Behavioral Health per FTE PCP and per Patient

Cost Estimate	$ per Year per FTE PCP*	$ per Year per Patient	Practice-Reported Capability
Minimum	405	0.45	The practice has access to a social worker who is employed by the parent organization and located at a neighboring clinic.
P25	1,292	1.12	The practice employs a behavioral health specialist (MSW), to which providers refer patients.
P50	3,723	4.13	The practice's behavioral health coordinator meets with patients for three visits and then refers patients for additional services if needed.
P75	9,097	7.42	A centrally located team of high-risk care coordinators work with high-risk patients across the parent organization. They provide various care-management services such as assisting with referrals, addressing barriers to care, locating access to affordable medication, and performing psychosocial assessments and counseling for certain behavioral health conditions. They may also see patients in hospitals or at home. Usually, the PCP refers high-use patients to these high-risk care coordinators.*
Maximum	25,731	16.02	The psychiatrist from the practice and three counselors from the parent organization provide behavioral health treatment. Patients are referred to these individuals by PCPs within the practice.

NOTE: Twenty-five practice-reported capabilities from 20 practices were used to populate this table. Of these capabilities, one had unknown costs. Practices with unknown costs for the capability are not included in determining cost percentiles. In comparisons among practices, costs per patient were not proportional to costs per FTE PCP because patient-panel sizes per FTE PCP varied widely.
*This practice-reported capability spans multiple standardized capabilities (i.e., the standardized capability is coupled with other standardized capabilities, and the cost estimates therefore include multiple capabilities).

As shown in Figure 5, the highest-cost behavioral services were for this standardized capability alone (without coupling to other standardized capabilities), and within our sample, there was no clear relationship between CPC+ participation, size, and costs.

Figure 5. Annual Costs of Behavioral Health per FTE PCP, with Practice Characteristics



NOTE: In this figure, the triangles represent capabilities of practices participating in CPC+, and the circles represent capabilities of practices not participating in CPC+. The size of each circle and triangle is proportional to the number of FTE PCPs in the practice.

Frontline Personnel Confirmation and Disconfirmation of Practice Leader Estimates

Among the 32 participants who commented on whether they provided services in the behavioral health area, 27 agreed with practice leaders that they didn't have a role in the capability, while one agreed that he/she did have a role in the capability and agreed on the quantity.

Three agreed that they did have a role in the capability but disagreed on the quantity of time. For two participants, their leader's estimate of time spent in this activity was off by more than a half-day and less than one day per week. For one participant, the leader's estimate of time spent in this activity was off by more than one day per week.

The remaining participant reported spending up to a half-day per week on behavioral health, even though the practice leader had not reported hours for that person on this capability.

High-Risk Patient Lists

As a standardized capability, we defined high-risk patient lists as follows: "The practice has a system or registry that generates lists of patients (population view) considered at high-risk for poor health outcomes or high costs of care."

As shown in Figure 6 and Table 12, the median annual cost per FTE PCP for a high-risk patient list was $2,614, with a wide range ($72 to $64,047), owing to a small number of high

Figure 6. Annual Costs of High-Risk Patient Lists per FTE PCP

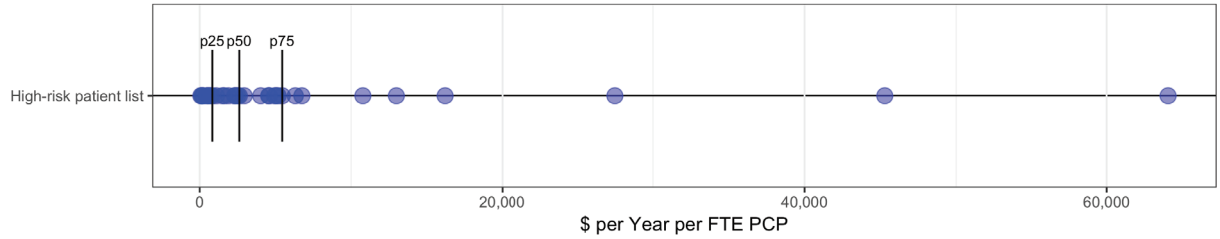


Table 12. Quantiles of Annual Costs of High-Risk Patient Lists per FTE PCP and per Patient

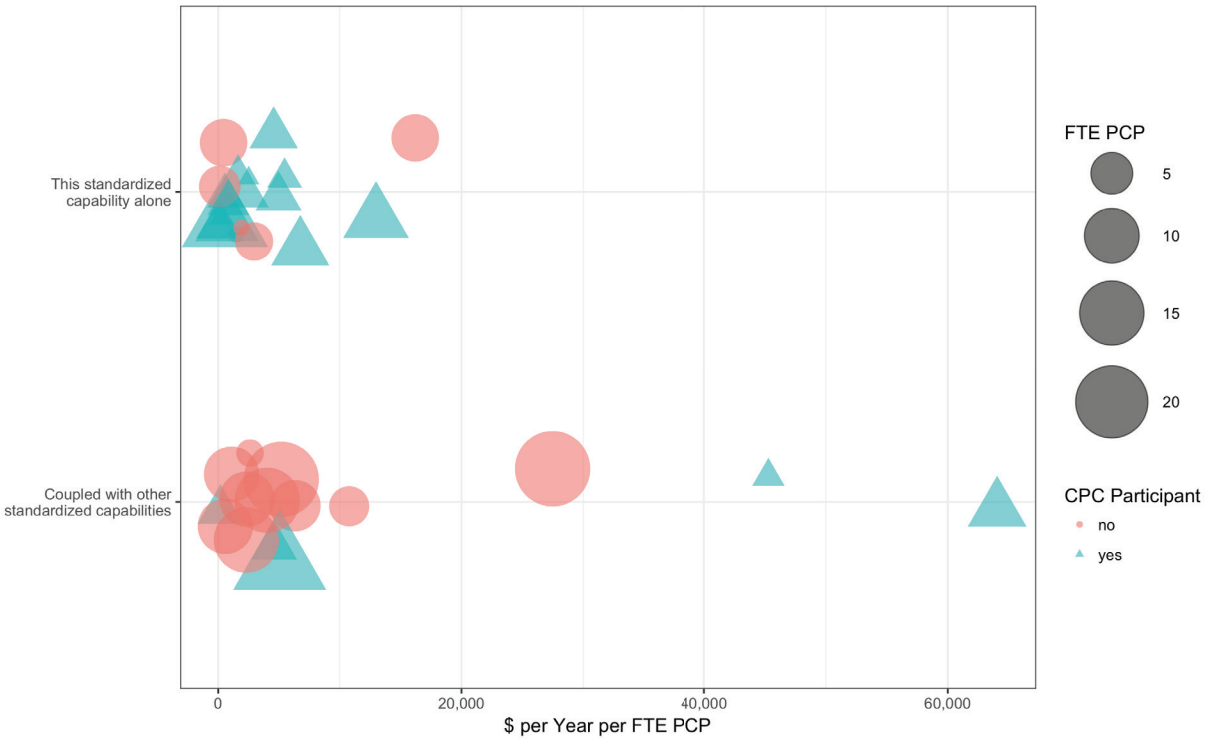
Cost Estimate	$ per Year per FTE PCP*	$ per Year per Patient	Practice-Reported Capability
Minimum	72	0.11	The practice identifies high-risk patients using analytics software.
P25	832	1.00	The practice assigns a risk-stratification score to each patient in the EHR based on the AAFP model. Those at high risk are flagged within the system for high-risk management.
P50	2,614	1.18	The practice signs a contract to participate in an ACO, which conducts patient surveys, supports the practice EHR, and provides the practice with a list of high-risk patients and patients in need of preventive services. The ACO is led by a local hospital, and to participate in this ACO, there is a fee for the physician and the NP.*
P75	5,447	5.65	A practice MA completes the general health-risk assessment form with all patients (which was initially developed by the medical group's previous care manager). The provider reviews the form and checks the final score to enter into the EHR. The practice risk stratifies patients based on this assessment. If the patient is high-risk, the practice will put an enrollment request in the patient's chart for care management. The nurse care manager for the patient's relevant conditions will contact the patient to enroll him or her in the program. The nurse care manager also manages the list of high-risk patients within the EHR care management module.
Maximum	64,047	16.16	A chronic-care coordinator is responsible for identifying patients with comorbid chronic-care conditions in the EHR, enrolling them in the practice's chronic-care management program, developing written care plans, helping them manage their conditions, and ensuring they receive needed services and follow-up care. Providers also review the care plans developed by the chronic-care coordinator.*

NOTE: Thirty-six practice-reported capabilities from 31 practices were used to populate this table. Of these capabilities, three had unknown costs. Practices with unknown costs for this capability are not included in determining cost percentiles. In comparisons among practices, costs per patient were not proportional to costs per FTE PCP because patient-panel sizes per FTE PCP varied widely.
*This practice-reported capability spans multiple standardized capabilities (i.e., the standardized capability is coupled with other standardized capabilities, and the cost estimates therefore include multiple capabilities).

outliers. Except for the highest-cost outliers, which were complex capabilities encompassing multiple standardized capabilities (not limited to the high-risk patient list itself), practice-reported capabilities were fairly similar in their descriptions. The capability descriptions suggest that much of the observed cost variation is driven by differences in staff labor hours.

As shown in Figure 7, the highest-cost outliers were for practice-reported capabilities that coupled high-risk patient lists with other standardized capabilities. Within our sample, CPC+ non-participants were more likely than CPC+ participants to couple their high-risk patient lists with other capabilities. There was no clear relationship between CPC+ participation, practice size, and costs.

Figure 7. Annual Costs of High-Risk Patient Lists per FTE PCP, with Practice Characteristics



NOTE: In this figure, the triangles represent capabilities of practices participating in CPC+, and the circles represent capabilities of practices not participating in CPC+. The size of each circle and triangle is proportional to the number of FTE PCPs in the practice.

Patient and Family Advisory Council

As a standardized capability, we defined a PFAC as follows: "The practice has a patient and family advisory council that meets with practice leaders or staff on a regular basis."

As shown in Figure 8 and Table 13, the median annual cost per FTE PCP for having a PFAC was modest (median $291, range $54–$1,309). The most expensive PFACs were attended by greater numbers of practice staff than were less expensive PFACs.

Figure 8. Annual Costs of PFAC per FTE PCP

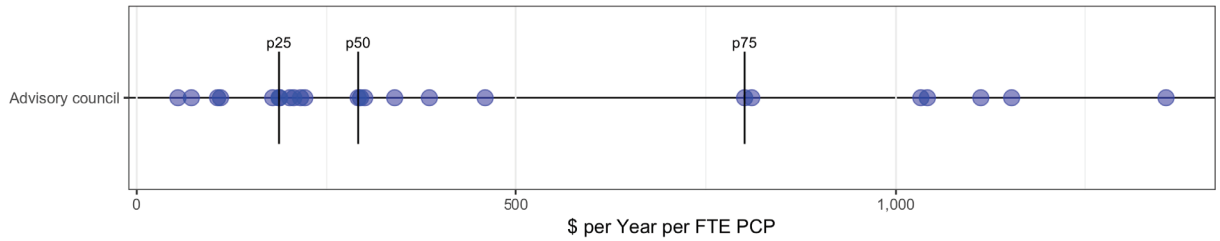


Table 13. Quantiles of Annual Costs of PFAC per FTE PCP and per Patient

Cost Estimate	$ per Year per FTE PCP*	$ per Year per Patient	Practice-Reported Capability
Minimum	54	0.03	The practice's PFAC meets six times per year.
P25	187	0.14	The practice administrator and one provider meet with a group of five patients quarterly.
P50	291	0.43	The practice has a standing PFAC.
P75	801	0.32	The practice holds a PFAC meeting to solicit patient feedback.
Maximum	1,356	2.61	The practice convenes a PFAC once a quarter. Practice staff who attend these meetings may include a social worker, behavioral health provider, or others. Food is provided.

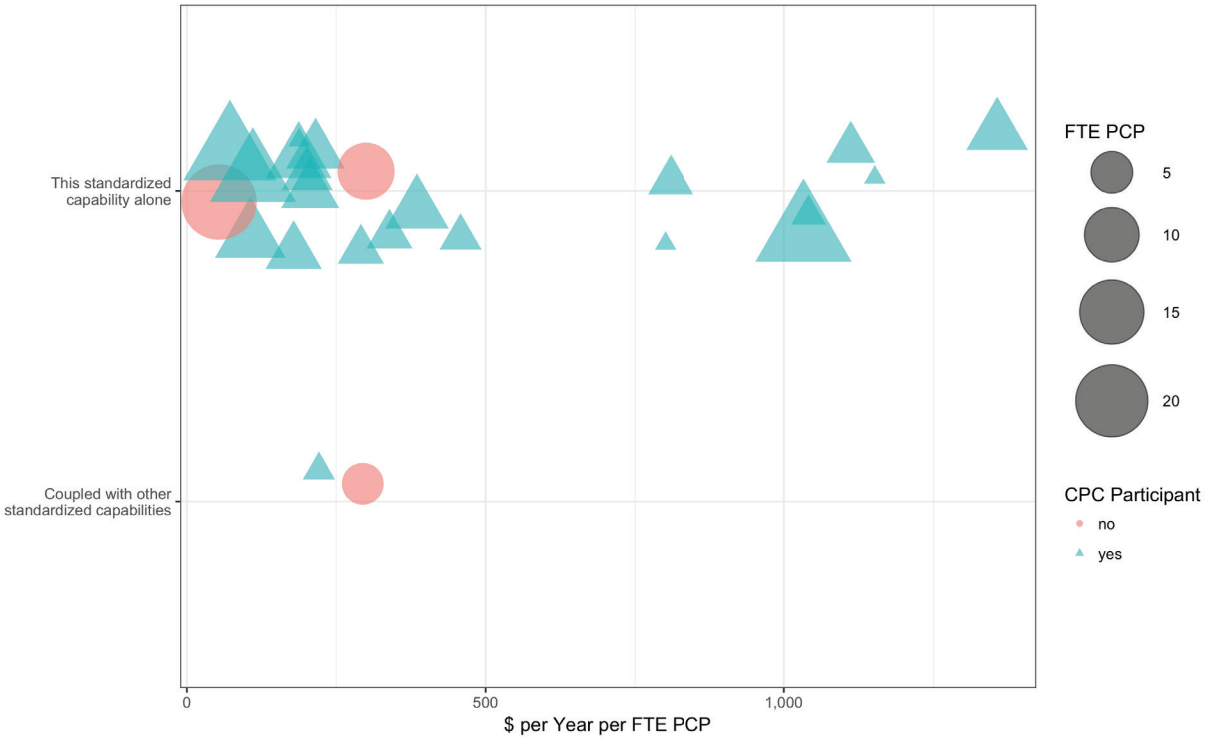
NOTE: Twenty-four practice-reported capabilities from 24 practices were used to populate this table. Of these capabilities, zero had unknown costs. In comparisons among practices, costs per patient were not proportional to costs per FTE PCP because patient-panel sizes per FTE PCP varied widely.
*This practice-reported capability spans multiple standardized capabilities (i.e., the standardized capability is coupled with other standardized capabilities, and the cost estimates therefore include multiple capabilities).

As shown in Figure 9, all but two PFACs could be cost estimated independently (i.e., they were not inextricably linked to other standardized capabilities), and with only three exceptions, all PFACs were in CPC+ participating practices.

Confirmation and Disconfirmation Results

We examined cost estimates reported by practice leaders to explore the validity of the estimates captured using the cost-reporting workbook. Frontline personnel were asked whether they participated in each capability selected for this validation test and, if so, how much time they spent per week on that capability. Thus, these interviews provided the opportunity to observe the level of confirmation and disconfirmation of the estimates previously captured in the

Figure 9. Annual Costs of PFAC per FTE PCP, with Practice Characteristics



NOTE: In this figure, the triangles represent capabilities of practices participating in CPC+, and the circles represent capabilities of practices not participating in CPC+. The size of each circle and triangle is proportional to the number of FTE PCPs in the practice.

cost-reporting workbooks. This chapter has presented the numerical results for medication management and behavioral health (above); the numerical results for additional capabilities are presented in the Appendix.

In this section, we present an overall summary of the validation results. First, we present the numerical results and then we present the reasons observed for disconfirmation, as discussed in the frontline personnel interviews.

Across the 12 capabilities captured in frontline personnel interviews, participants confirmed their leaders' labor estimates (agreeing either that they didn't have a role in the capability or did have a role in the capability and agreeing on the quantity of time they contributed) more than half the time. Depending on the capability, this value ranged from 47 percent to 94 percent, with an average of 72 percent agreement.

On average, 11 percent of the time, participation in a capability was confirmed, but the quantity of hours contributed was off (ranging from 0 percent to 25 percent depending on the capability). When these estimates were off, it was most often by less than 0.5 days per week.

On average, 18 percent of frontline participants disagreed with practice leaders on whether they had a role in the capability at all (ranging from 4 percent to 32 percent depending on the capability). Specifically, an average of 5 percent of participants were incorrectly reported by the

practice leader as performing the activity (ranging from 0 percent to 13 percent depending on the capability). The remaining 13 percent reported participating in the activity, although the leader did not report this (ranging from 0 percent to 29 percent depending on the capability). In these cases, the estimates were off most often by less than 0.5 days per week.

Reasons for Discrepancies

Multiple reasons for these discrepancies were given in frontline personnel interviews. Reasons included hours per week being hard to estimate (e.g., because they vary depending on the needs of the particular patients seen); capabilities overlapping one another such that hour estimates include more than one capability; and tasks within a capability not always being shared evenly, so that the person being interviewed may be doing more or less than the "average" reported by practice leaders. As we demonstrate in our discussion of the findings in Chapter Five, practice leaders are likely unaware of many of the nuances associated with frontline roles on an hourly, daily, and patient-specific basis that exist across their entire practice.

Another type of discrepancy involved capabilities with similar goals, such as previsit planning and team huddles, which practices perform together in a step-wise manner. In this case, the two capabilities were seen on a continuum, with one type of staff member (e.g., MAs) performing the previsit planning while other types of staff (e.g., NPs, physicians) used those materials to perform team huddles. Managers reported these different types of staff as being involved in both activities, while staff mentioned not being involved in activities they were not performing.

Estimated Marginal Cost of an Office Visit

We asked each participating practice to report the average time allocated to a follow-up visit with an established patient and then asked what the marginal cost would be of providing one more such visit (i.e., the costs of keeping one PCP and associated staff member in the office just long enough to provide the visit, plus any associated nonlabor costs). Unlike our method for estimating the costs of comprehensive primary care capabilities, for office visits we asked for gross costs (without accounting for any revenue received by the practice). Thirty-nine practices provided these data. Of these practices, 16 reported that a follow-up visit with an established patient was allocated 10 to 19 minutes; 15 reported allocating 20 to 29 minutes, and eight reported allocating 30 minutes or more. Including all visit lengths, the median marginal cost was $62 (range, $28 to $350). Dividing costs by visit length, the median marginal cost per minute was $3.27 (range, $1.46 to $15).

5. Selected Findings: Implementation of Comprehensive Primary Care Capabilities

While Chapter Four reports on capabilities as briefly mentioned by practice leaders during the workbook data collection, this chapter uses interviews with frontline personnel to understand how variations in practices' organization and implementation of select capabilities may account for differences in the intensity and costs of capabilities provided. We report on how frontline personnel described their roles in delivering comprehensive primary care capabilities. Also, we describe participants' thoughts on the evolution of these capabilities at their practices over time, recognizing that not all interviews or interviewees were able to describe this history.

Here, we report on the implementation of the same capabilities discussed in Chapter Four—behavioral health and medication management. To provide additional context about these capabilities, medication management was performed by the largest subset of frontline participants and took the most time per week (when compared to the other activities of interest); participants who were engaged in behavioral health also spent a great deal of their time on this capability (as compared to the other activities of interest).

We report on additional capabilities (e.g., care management for high-risk patients, previsit planning, team huddles, and written care plans) in the Appendix.

Medication Management

Participants in a wide number of roles were involved in activities integral to the medication management capability, including MAs, clinicians, pharmacists, care managers, practice managers, NPs, and medical records personnel. Ten out of 32 interviews were with personnel involved in medication management, and their interviews revealed much variability as to how they were involved in this capability, including when they participated, the types of activities they performed, and the types of patients they assisted.

MAs and clinicians reported performing their duties during and between patient visits for every patient they saw. Pharmacists were involved for more complex patients and when primary care team members had specific questions. Care managers performed medication management for patients they were assigned to manage. Medical records personnel facilitated connectivity between the practice and outside providers for medication management. In addition to these variations, personnel reported nuances in their specific roles, in terms of how they worked with medications and/or patients.

One pharmacist described being flexible in approaching patient medication needs, employing either an overall (holistic) approach or a disease-specific approach, as needed.

> *And when I'm running pharmacy clinic, people are sent to us for, sometimes it's medication access, sometimes it's medication education. The main thing that we do, though, is actually what we call either comprehensive medication management where we're thinking holistically about a patient and addressing all of their medication issues. Or we do disease state management where we are focused on a particular diseases state, whether it's diabetes or hypertension or depression or osteoporosis or pain, whatever that might be. . . . In pharmacy clinic, patients will come and see me and we'll go through their medication list holistically, or sometimes just more targeted on a specific disease state and address any medication-management issue that they might have.*

Roles also appear to vary across a spectrum, with some roles having more brief periods of specific/narrow interaction with medication management and with others having more complex, extended engagement in this capability.

On the brief and narrow end of the spectrum, a medical records staff member described his/her role in medication management as facilitating coordination of information.

> *. . . We'll get faxes [from insurance companies or pharmacies] . . . that say your patient needs an advisory on this medication, or they're non-adhering to this medication, something of that nature. We'll forward the fax to the appropriate provider, letting them know that. So I'm kind of the middle man of that because I intercept all those faxes. Medical records is in charge of incoming and outgoing faxes, so when we get . . . anything that has to do with prescription for a patient, then we are the ones in charge of getting that to the appropriate provider or medical assistant or whoever needs that for that patient.*

Also toward the brief and narrow end of the spectrum, an MA described her role as focusing on checking that medications are taken as directed and processing refills.

> *When the patient comes in, I verify all their medications and make sure their doses are right, and the directions. And then . . . if there's anything that needs to be changed, the doctor would do that and I am the one that, when they need refills, . . . gets the refills and looks to make sure that they need a refill and if they've done things that need to be done in order to get the refill.*

In addition to assisting with prescription refills, a practice manager also mentioned following up on items, as needed.

> *I do a lot of the follow-up and also just spot-checking. I do fill in for people, like if a care manager is not here for some reason or other, then I would assist with that. But mostly my role as practice manager is just printing reports and just doing spot-checking on how the prescription refills were done, if there's been follow-up and if the protocols for prescription refills are being followed.*

Care managers appear to be more widely and frequently involved in medication management and at intersections with other capabilities. For example, one care manager described verifying various aspects of medications, including the refill process, while another mentioned assisting with patient education and self-management related to medication management.

Also at this mid-level on the spectrum, an NP described working with patients to make sure they understood their medications and finding community resources to help ensure patients adhere to the medication plan.

> *Prescribing meds and discussing meds with patients, teaching them about their meds and how to take them and what side effects could be. And then directing the nurse to send the medication orders to the pharmacy. . . . And then if there's a patient that we're not sure if they're taking their medication, then there's calls to pharmacy to confirm that they're getting the medication we're prescribing. And sometimes we bring in home health or the Medicaid worker to check on the patient themselves to make sure that they are taking what we're telling them to take.*

A clinician, on the other hand, described a much more complex role he/she had, which took place both during the patient visit (involving patient education and self-management) and outside the visit (consisting of reviewing medication information that came from outside the practice and determining next steps).

> *I mostly do that just within the context of [the] office visit . . . not only are we going over, Are you compliant with your medications? What's working, what's not working? But I'm always trying to get at: if it's not working, why is it not working? There's usually something, whether it's financial or it's the education piece or they don't really understand what needs to be done or how to do it. So, within that context, I'm identifying where to fill that gap. So, if it's social needs, that is something that we are addressing and placing referrals for different services. If it is an educational piece, say diabetes, we refer for diabetes education, cardiac rehab, those sorts of things.*

Another clinician also described their role in medication management as complex, involving an iterative process among patients, pharmacy, and insurance companies that impacted all patient visits.

> *It involves reviewing the medications, reviewing how they're dosed, if they're getting them filled correctly, if they're taking them correctly, reviewing medications that are prescribed by providers outside of this office, battling with insurance companies to get prescriptions covered. Frequent messages throughout the day from pharmacies and insurance companies about changing medications due to formulary issues. Trying to help patients figure out how to afford the things they can't afford. Sometimes it involves referrals. Sometimes that involves just a lot of paperwork and documentation. I mean, it's a large part of every office visit.*

Evolution was not discussed specifically in the context of medication management.

Behavioral Health

Unlike medication management activities, which were performed by many personnel types, behavioral health roles were somewhat more concentrated, including licensed marriage and family therapists (LMFTs), care managers, and NPs. Some of these personnel also spent a great deal, if not all, of their time delivering behavioral health services in the primary care setting. They reported primarily working separately from primary care teams, spending all of their clinic time on behavioral health-related work and interacting with primary care teams infrequently to discuss patient needs and coordinate care plans. The number of LMFTs varied across sites, with one LMFT indicating that she was the only specialist specifically trained in the area of psychological health at her site, while another LMFT was more focused on managing a staff of 18 personnel, including psychiatrists, psychotherapists, and support staff across multiple integrated sites. A third behavioral health interviewee had a managerial role and split time between providing behavioral health services and administrative duties. All described the evolution of this capability within their clinic.

While we referred to "behavioral health" as one capability within the comprehensiveness domain, this capability included activities similar to other capabilities found in primary care but were made specific to behavioral health services and patients. For example, behavior health personnel also engaged in creating and updating written care plans. Sometimes those care plans were separate from those created and managed by the primary care team; other times, the items related to behavioral health were integrated with primary care items into one care plan for the patient. One LMFT provided a quick glimpse of her role as including written care plans for behavioral health in the following ways:

> *It's clinical notes, it's making phone calls, it's writing up treatment plans, it's doing research, it's reaching out to providers to make sure that I have a comprehensive treatment plan for patients.*

Other reported activities included appointment assistance, patient education and self-management support, medication management, previsit planning, specific programs for high-risk patients (e.g., opioid patients), and empanelment for behavioral health. One LMFT described her work in these areas as follows: Appointment assistance involved scheduling her own patients, rescheduling them, and checking in on cancelations. Patient education and self-management support involved providing psychoeducation that focused on resources, services, and barriers relevant to patients. Medication management included discussing adherence with patients. Previsit planning for existing patients involved time spent reviewing patient information that occurred between patient visits for about 10 minutes before each 50-minute patient session. She also mentioned other activities, for example, conducting outside research to share with patients, assisting with Individualized Education Programs for children, and visiting "residential assisted living facilities for patients who have a hard time with mobility."

The behavioral health specialist who split time between clinical and administrative tasks worked primarily in a setting that used a team approach to providing patient care. She worked with other team members, including clinicians, care managers, and pharmacists. Care management was a task that was performed by those in behavioral health in some situations:

> *We probably do end up doing some care management for high-risk patients but not really formally. Like if we're taking on those patients as our own patients for mental health or behavioral health services and there's some sort of care management piece that needs to happen that is not happening, then we may take that on or we may get them connected with appropriate services. But I wouldn't say that's a big piece of what we do.*

The LMFT that was the sole behavioral health provider for her practice noted that one factor that allowed her to work effectively with clinicians was proximity to them, for quick consultations as needed.

> *We don't have regular care meetings where we kind of do case review, but we do have ongoing, sort-of free-flow consultations. So I'll grab one of the providers in the hallway and check in about a medication question or give updates about any sort of reaction to medications or questions or treatment updates. Or they might come to my office and check in with me or send me an email if they have any questions or updates.*

The LMFT that was part of a larger group of behavioral health providers across multiple sites also emphasized collaboration with physicians. She indicated that this collaboration occurred electronically through the EHR and through face-to-face discussions. Her discussion was primarily focused on how their sites used behavioral health services and was less focused on what she specifically does, given her current focus on the administrator role. She discussed variability in the theoretical models that the therapists used to treat patients, which has implications for the specific treatments selected, and noted that therapists have the freedom to provide treatment consistent with their preferred approach.

At their sites, psychological services were provided to stakeholders beyond patients; specifically, they provided stress-reduction courses to staff and also "teach throughout the community . . . we are frequently doing presentations in our region on mental health topics."

The behavioral health specialist who split clinical and administrative duties noted that part of behavioral health involved connecting patients with community resources.

> *And so we'll go in and meet patients and do psychoeducation maybe about what their diagnosis is or what being connected to behavioral health services can provide for them. Or give them resources in the community, in terms of things like transportation or where they can get food or shelter or other mental health services that may be more appropriate for their needs, and we'll get them connected with those, as well.*

All behavioral health participants discussed the evolution of behavioral health at their respective practices. One LMFT recounted that she created this role when it had not existed previously. She noted that office/practice space was an initial challenge for her in terms of seeing patients, and it remained a challenge if the practice wanted to grow behavioral health services. The other primary challenge was getting her caseload started, given that patients and clinicians did not know her initially. She estimated that this ramp-up took 1.5 to 2 years. She did not perceive her role as changing over time, although she reported that her skills had improved as she accumulated more training and experience. She noted that she was initially providing more "social work" type of assistance to patients but that this changed as her skillset matured. She identified physician support and office manager support as key facilitators in helping behavioral health become integrated into the practice.

The LMFT that was also an administrator implemented the same integrated care approach that she had previously implemented in the hospital setting. This approach was developed in collaboration with a psychiatrist and a therapist, and once their department was "shut down" in the hospital, she continued to champion the integrated approach at primary care clinics. Given the shift from hospital-based to clinic-based care, the key change she noticed was the way referrals happened where the latter "changed and the amount of collaboration with the primary care doctors went up significantly because we're in the same spaces now. The actual services we provided didn't change." There have been some personnel changes; one psychiatrist left and this has resulted in them "not doing psychiatric med management on site. We're only doing psychotherapy currently."

She tried to use a team huddle approach but "abandoned" it because clinicians did not have the time to make these meetings. So they now use an "open-door policy where, if our door is open and a doc wants to come in and ask about a patient, they can. We attend their provider meetings—they last 15 minutes—to see what they need and if we need to consult about patients."

The interviewee with a managerial role noted that their practice had evolved such that they had received more training in treating addiction, given the increased prevalence of addiction. The site planned to bring in a professional to train all behavioral health specialists in new treatment techniques. At the same site, an NP noted participating in a 15-hour motivational interviewing course to improve skills in talking with patients about behavioral health issues. The other way this site has evolved is that behavioral health specialists need to schedule more patients to offset the expected 15 to 20 percent no-show rate, given higher overhead rates for office space and other expenses.

6. Summary and Conclusions

This project developed and piloted a new method to estimate the expenses incurred by practices to provide comprehensive primary care capabilities. A major goal of this new method was to collect data in sufficient detail to understand the causes of cost variation between practices, distinguishing between different costs for different services and different costs for the same service.

The drivers of cost variation can inform the design of payment models that reimburse practices for their comprehensive primary care capabilities. When high costs stem from inefficiency (i.e., when high prices are incurred for the same service that other practices can provide at a lower price), payment could be based on the costs incurred by more-efficient practices without compromising the level of services patients receive. However, when high costs for a given capability stem from offering a higher level of service (i.e., a capability likely to provide greater patient benefit), payers might instead determine a desired level of service, reimburse the costs corresponding to this level of service, and then re-specify the capability (for payment purposes) in sufficient detail to distinguish it from lower levels of service.

New Method to Estimate the Practice Expenses of Providing Comprehensive Primary Care Capabilities

To collect cost and capability data in sufficient detail to inform payment for comprehensive primary care capabilities, we developed a mixed-methods strategy. This strategy consisted of an initial interview with practice leaders to identify their comprehensive primary care capabilities and the types of costs incurred by each, followed by researcher-assisted completion of a workbook, tailored to each practice, that gathered data on the quantities of labor and nonlabor costs devoted to each comprehensive primary care capability. These were marginal cost estimates, net of any FFS revenues received (i.e., subtracting from gross costs any revenues received as a consequence of billing for the capability). In a final brief interview, practice leaders reviewed summaries of the cost estimates and made corrections, if needed, before approving them.

Project staff assigned each practice-described capability to zero, one, or more than one of 36 standardized comprehensive primary care capabilities (e.g., medication management, transitional care). This data-collection strategy avoided asking practice leaders to categorize their own practice's capabilities, thus reducing the likelihood that cost variation for a given standardized capability would stem from differences in how practice leaders defined it. By allowing assignment of more than one standardized capability to each practice-described capability, the data-collection strategy also avoided asking practices to disaggregate the costs

of complex capabilities that might span multiple standardized capabilities (a potential source of substantial measurement error).

We assessed the validity of labor estimates provided by practice leaders by conducting interviews with frontline personnel and comparing capability-specific estimates of their own labor with those given by practice leaders. Reasons given for estimates that were disconfirmed are also presented.

Performance of the New Cost-Estimation Method

The cost-estimation method we developed required substantial time commitments from practice leaders and study staff. Even though participating practice leaders generally understood the importance of the study and were supportive of it (as a means of helping CMS gather data that might help inform future payment programs and out of a general sense of curiosity), many also reported being overwhelmed by competing priorities, which prolonged data collection. The median interval between interview completion and practice approval of the cost summary was 96 days (range, 40 to 232 days). The financial incentive of $3,750 did not seem to motivate practices to respond quickly to later phases of data collection. The time and effort involved in data collection, not financial resources, seemed to be the limiting factor.

Data collection from practices affiliated with parent organizations was especially challenging. Gathering data from organization-affiliated practices, relative to that of independent practices, involved more parties (e.g., both practice- and organization-level leaders), posed greater scheduling challenges, and sometimes prevented practice leaders from accepting direct payment for participation (with the incentive payment paid to the parent organization instead). This resulted in longer data-collection periods for practices affiliated with parent organizations (median, 105 days) than independent practices (median, 75 days). Moreover, estimating practice-level expenses for capabilities supported by parent organizations was difficult, particularly when there was no clear way to apportion expenses to a specific practice.

Practices also had difficulty estimating the startup costs of comprehensive primary care capabilities. For capabilities that had been adopted more than a year or two before data collection, practice leaders were frequently uncertain regarding one-time initial labor-hour expenditures (e.g., costs of staff training) and nonlabor expenses.

Practice leaders used widely divergent methods of estimating panel sizes (e.g., number of patients listed in the practice's EHR as being empaneled to a practice PCP; number of patients seen in a given year, regardless of whether they were truly considered to be on the practice's panel), and many reported high levels of uncertainty regarding their panel-size estimates.

Despite these challenges, practice leaders who completed data collection reported that the final capability descriptions were accurate and that cost summaries had face validity. Several remarked that participation was an eye-opening exercise, generating new insights into financial sustainability. No participating practice reported having previously examined its expenses for

comprehensive primary care capabilities to the degree of detail elicited by this study's cost-estimation method.

Costs of Comprehensive Primary Care Capabilities

Fifty practices sampled for diversity across CPC+ participation status, geographic region, rural status, size, and parent-organization affiliation completed data collection. Practices varied considerably in the comprehensive primary care capabilities they adopted. The most commonly adopted capabilities were empanelment (92 percent of practices), same-day or next-day office visits (90 percent), patient education and self-management support (88 percent), and software-based communication infrastructure (86 percent).

The costs of standardized comprehensive primary care capabilities ranged widely. Medication management had the highest annual median cost per FTE PCP ($11,469 per year) and extended hours had the lowest ($0), because the majority of practices offering extended hours did so without incurring marginal costs (i.e., no overtime and no unfilled appointment slots).

In general, the cost variation among practices ostensibly providing the same comprehensive primary care capability (e.g., among the multiple practice-reported services categorized as "medication management") was at least partially attributable to substantial differences in the level of service provided. However, price variation still played a role, such as when high-cost outlier practices appeared to offer the same service as lower-cost practices (e.g., because they used more expensive labor mixes). With a sample of 50 practices, we were unable to estimate quantitatively the relative contributions of service-level variation and price variation to observe variation in overall costs.

For nearly all capabilities, labor expenses exceeded nonlabor costs, and ongoing annual costs exceeded one-time startup costs. However, we do not consider the startup costs gathered using our methodology to be reliable. Practices might have under-reported startup costs due to difficulty estimating them.

Frontline personnel generally confirmed practice leader reports (72 percent average agreement across capabilities) regarding their participation in each capability and the amount of time they devoted to it. However, there were instances in which frontline participants disconfirmed practice leader reports by indicating that they did participate in a capability when they were not reported to do so (13 percent on average), did not participate in a capability when they were reported to participate (5 percent on average), or did participate but to a different degree (most often with a discrepancy of less than 0.5 days per week) than was reported by practice leaders (11 percent on average). Overall, capability descriptions reported by practice leaders were generally consistent with similar data gathered from frontline staff. Our goal was not to determine whether levels of agreement between practice leaders and frontline participants were adequate (which might depend on the intended use of such data); rather, our focus was on

highlighting discrepancies to document them and provide specific examples from frontline participants about reasons that discrepancies occurred.

Considerations for Future Data Collection and Payment Policy

Even within a small sample of 50 practices, the heterogeneity we observed in the costs and content of standardized comprehensive primary care capabilities highlights the importance of gathering detailed data on practice capabilities. Without sufficiently detailed capability descriptions tied to their costs, APMs would risk underpaying for some desired capabilities (e.g., if payment amounts are insufficient to reimburse practices for a desired high level of service) and overpaying for others (e.g., when practices provide the same level of service but payment amounts are skewed by high-cost outliers).

A mixed-methods approach to estimating the costs of comprehensive primary care capabilities, deployed on a larger scale than in the current study, could serve as a robust basis for future payment models that seek to incentivize and sustain comprehensive models of primary care. However, gathering these data is labor-intensive for both data collectors and practice leaders, with few opportunities for economies of scale. To provide complete and accurate data (and to identify when costs could not be estimated reliably), practice leaders frequently required conversations with interviewers experienced in primary care capabilities and activity-based cost estimation.

To address the challenges of collecting such detailed data, future efforts could plan for long data-collection periods, experiment with different financial incentives for participation (e.g., bonuses for early completion), try other types of incentives, or explore the possibility of compulsory participation (with financial compensation for sampled practices). Additional methodological development might be necessary to better estimate the startup costs of comprehensive primary care capabilities, capture the costs borne by parent organizations, estimate patient-panel sizes consistently, and determine how much cost variation is attributable to differences in patient population needs. For startup costs in particular, it might be necessary to conduct longitudinal cost gathering, to capture such one-time costs as they occur rather than relying on practice leaders' records and recollections. Complementary methods, such as time and motion analysis (Westbrook and Ampt, 2009), could also help address the 28 percent disagreement rate between practice leaders and frontline staff regarding labor estimates, thus improving the validity of labor-cost estimates.

Despite these methodological and logistical challenges, improving the accuracy and detail of the estimated expenses that practices incur to offer comprehensive primary care capabilities would help CMS achieve its strategic goals for comprehensive primary care and serve as a resource for practices and payers throughout the United States.

References

Andersen, D. L., L. F. Luna-Reyes, V. G. Diker, L. Black, E. Rich, and D. F. Andersen, "The Disconfirmatory Interview as a Strategy for the Assessment of System Dynamics Models," *System Dynamics Review*, Vol. 28, No. 3, 2012, pp. 255–275.

Berry, C. A., T. Mijanovich, S. Albert, C. H. Winther, M. M. Paul, M. S. Ryan, C. McCullough, and S. C. Shih, "Patient-Centered Medical Home Among Small Urban Practices Serving Low-Income and Disadvantaged Patients," *Ann Fam Med*, Vol. 11, Suppl 1, 2013, pp. S82–89.

Casalino, L., R. R. Gillies, S. M. Shortell, J. A. Schmittdiel, T. Bodenheimer, J. C. Robinson, T. Rundall, N. Oswald, H. Schauffler, and M. C. Wang, "External Incentives, Information Technology, and Organized Processes to Improve Health Care Quality for Patients with Chronic Diseases," *Jama*, Vol. 289, No. 4, 2003, pp. 434–441.

Center for Rural Health, Temporary Zip RUCA 3.10 File Access, 2014. As of June 1, 2018: https://ruralhealth.und.edu/ruca

Centers for Medicare & Medicaid Services, 2015. Chronic Care Management Services. As of July 13, 2018: https://www.cms.gov/Outreach-and-Education/Medicare-Learning-Network-MLN/MLNProducts/Downloads/ChronicCareManagement.pdf

Centers for Medicare & Medicaid Services, Comprehensive Primary Care Plus, 2016. As of July 11, 2018: https://innovation.cms.gov/initiatives/comprehensive-primary-care-plus

Fleming, B., A. Silver, K. Ocepek-Welikson, and D. Keller, "The Relationship Between Organizational Systems and Clinical Quality in Diabetes Care," *Am J Manag Care*, Vol. 10, No. 12, 2004, pp. 934–944.

Fleming, N. S., B. da Graca, G. O. Ogola, S. D. Culler, J. Austin, P. McConnell, R. McCorkle, P. Aponte, M. Massey, and C. Fullerton, "Costs of Transforming Established Primary Care Practices to Patient-Centered Medical Homes (PCMHs)," *J Am Board Fam Med*, Vol. 30, No. 4, 2017, pp. 460–471.

Friedberg, M. W., D. G. Safran, K. L. Coltin, M. Dresser, and E. C. Schneider, "Readiness for the Patient-Centered Medical Home: Structural Capabilities of Massachusetts Primary Care Practices," *J Gen Intern Med*, Vol. 24, No. 2, 2009, 162–169.

Friedberg, M. W., K. L. Coltin, S. D. Pearson, K. P. Kleinman, J. Zheng, J. A. Singer, and E. C. Schneider, "Does Affiliation of Physician Groups with One Another Produce Higher Quality Primary Care?" *J Gen Intern Med*, Vol. 22, No. 10, 2007, pp. 1385–1392.

Friedberg, M. W., P. S. Hussey, and E. C. Schneider, "Primary Care: A Critical Review of the Evidence on Quality and Costs of Health Care," *Health Aff*, Vol. 29, No. 5, 2010, pp. 766–772.

Gabbay, R. A., M. W. Friedberg, M. Miller-Day, P. F. Cronholm, A. Adelman, and E. C. Schneider, "A Positive Deviance Approach to Understanding Key Features to Improving Diabetes Care in the Medical Home," *Ann Fam Med*, Vol. 11, Suppl 1, 2013, pp. S99–107.

Halladay, J. R., K. Mottus, K. Reiter, C. M. Mitchell, K. E. Donahue, W. M. Gabbard, and K. Gush, "The Cost to Successfully Apply for Level 3 Medical Home Recognition," *J Am Board Fam Med*, Vol. 29, No. 1, 2016, pp. 69–77.

Health Resources and Services Administration, "Defining Rural Population," January 2017. As of June 20, 2018: https://www.hrsa.gov/rural-health/about-us/definition/index.html

Hennig, C., "FPC: Flexible Procedures for Clustering." *R Package,* Version 2, 2015, pp. 1–10. As of July 13, 2018: https://cran.r-project.org/web/packages/fpc/index.html

Kaufman, L., and P. J. Rousseeuw, *Finding Groups in Data: An Introduction to Cluster Analysis.* New York: Wiley, 1990.

Legendre, P., and L. Legendre, *Numerical Ecology*, Amsterdam: Elsevier Science BV, 2012.

Magill, M. K., D. Ehrenberger, D. L. Scammon, J. Day, T. Allen, A. J. Reall, R. W. Sides, and J. Kim, "The Cost of Sustaining a Patient-Centered Medical Home: Experience From 2 States," *Ann Fam Med*, Vol. 13, No. 5, 2015, pp. 429–435.

Martsolf, G. R., R. Kandrack, R. A. Gabbay, and M. W. Friedberg, "Cost of Transformation Among Primary Care Practices Participating in a Medical Home Pilot," *J Gen Intern Med*, Vol. 31, No. 7, 2016, pp. 723–731.

McNellis, R. J., J. L. Genevro, and D. S. Meyers, "Lessons Learned from the Study of Primary Care Transformation," *Ann Fam Med*, Vol. 11, Suppl 1, 2013, pp. S1–5.

Mogyorosy, Z., and P. Smith, *The Main Methodological Issues in Costing Health Care Services: A Literature Review*, York, UK: University of York, 2005.

National Committee for Quality Assurance, *PCMH 2014 Standards*, Washington, D.C.: National Committee for Quality Assurance, 2014.

Nocon, R. S., R. Sharma, J. M. Birnberg, Q. Ngo-Metzger, S. M. Lee, and M. H. Chin, "Association Between Patient-Centered Medical Home Rating and Operating Cost at Federally Funded Health Centers," *Jama*, Vol. 308, No. 1, 2012, pp. 60–66.

Patel, M. S., M. J. Arron, T. A. Sinsky, E. H. Green, D. W. Baker, J. L. Bowen, and S. Day, "Estimating the Staffing Infrastructure for a Patient-Centered Medical Home," *Am J Manag Care*, Vol. 19, No. 6, 2013, pp. 509–516.

Peikes, D., E. F. Taylor, S. Dale, A. O'Malley, A. Ghosh, G. Anglin, K. Swankoski, A. Zutshi, L. Converse, and R. Brown, *Evaluation of the Comprehensive Primary Care Initiative: Second Annual Report*, Mathematica Policy Research, 2016.

QSR, *NVivo Qualitative Data Analysis Software, Version 10*, Melbourne, Australia: QSR International Pty Ltd., 2012.

R Core Team, *R: A Language and Environment for Statistical Computing,* Vienna, Austria: R Foundation for Statistical Computing, 2017.

Robert Graham Center, Blended Payment Models and Associated Care Management Fees, 2013. As of July 13, 2018: https://www.graham-center.org/content/dam/rgc/documents/publications-reports/presentations/Care%20Management_Nov2013%20(1).pdf

Shao, H., L. Brown, M. L. Diana, L. A. Schmidt, K. Mason, C. I. Oronce, and L. Shi, "Estimating the Costs of Supporting Safety-Net Transformation into Patient-Centered Medical Homes in Post-Katrina New Orleans," *Medicine (Baltimore)*, Vol. 95, No. 39, 2016, p. e4990.

SK&A, homepage, 2018. As of July 11, 2018: http://www.skainfo.com/

Starfield, B., L. Shi, and J. Macinko, "Contribution of Primary Care to Health Systems and Health," *Milbank Q*, Vol. 83, No. 3, 2005, pp. 457–502.

Venables, W. N., and B. D. Ripley, *Modern Applied Statistics with S*, New York: Springer-Verlag, 2002.

Wasserman, M., J. Berninger, and J. Gerteis, *Estimating the Costs of Primary Care Transformation: A Practical Guide and Synthesis Report*, Rockville, Md.: Agency for Healthcare Research and Quality, 2015.

Westbrook, J. I., and A. Ampt, "Design, Application, and Testing of the Work Observation Method by Activity Timing (WOMBAT) to Measure Clinicians' Patterns of Work and Communication," *Int J Med Inform*, Vol. 78, Suppl 1, 2009, pp. S25–33.

Zuckerman, S., K. Merrell, R. Berenson, D. Gans, W. Underwood, A. Williams, S. Erickson, and T. Hammons, *Incremental Cost Estimates for the Patient-Centered Medical Home*, New York: The Commonwealth Fund, 2009.